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ABSTRACT

In this set of four booklets on collecting data, primary grade students learn how to record data, do an experiment, make an opinion survey, and choose a sample. The major emphasis in all Unified Sciences and Mathematics for Elementary Schools (USMES) units is on open-ended, long-range investigations of real problems. In most instances students learn through observing results of their own and their classmates' experiments. However, students may recognize the need for certain facts and/or skills during their investigations. Although some children prefer to work things out for themselves, others may ask for help. USMES "How To Sets" are designed to provide such assistance. Each booklet in a set contains several examples of children using a skill being taught, each example emphasizing a different aspect of the skill or a potential pitfall. Cover pages summarize what is being taught by illustrating the general problem and solution. There is no sequence to the sets (or booklets within sets) and they should not be used out of the context of childrens' open investigation of a practical problem. (Author/JN)

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HOW TO SET

COLLECTING DATA

USMES
UNIFIED SCIENCE AND MATHEMATICS FOR ELEMENTARY SCHOOLS

IN THIS SET STUDENTS WILL FIND OUT HOW TO ...

RECORD DATA

DO AN EXPERIMENT

MAKE AN OPINION SURVEY

CHOOSE A SAMPLE

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WHAT IS USMES?

USMES challenges students to solve real problems within their school and community. Children tackle problems like a busy or unsafe intersection near their school, classroom furniture that doesn't fit them, or playgrounds that are crowded or uninteresting. These problems have immediate and practical impact on students. They have no established, correct solutions--students take or recommend action based upon whatever data they collect and analyze. Furthermore, the children themselves, not the teacher, direct the problem-solving process.

Solving real problems is interdisciplinary: skills, processes, and concepts from science, mathematics, social science, and language arts all play a part. For example, students conduct opinion surveys, build measuring devices, write letters, and make and use graphs. They also make decisions, work productively in small groups, and develop and clarify values.

The USMES curriculum is organized into twenty-six problems, or units, that have been developed in the classroom by teachers and students in a wide variety of schools. Most units can be used in grades K-8 although the level at which students approach a problem and develop a solution will vary according to age, ability, and interest.

RESOURCES FOR AN USMES PROGRAM

In addition to the USMES "How To" Series, there are--

The USMES Guide: This book describes the USMES project, real problem solving, classroom strategies, the Design Lab, the units, and the support materials as well as ways that USMES helps students learn basic skills.

Teacher Resource Books (one per unit): Each of these guides to using USMES units describes a broad problem, explains how students might narrow that problem to meet their particular needs, recommends classroom strategies, and presents logs from teachers whose classes have worked on the unit.

Design Lab Manual: This guide helps teachers and administrators set up, run, and use a Design Lab--a place with tools and materials where students can build things they need for their work on USMES units. A Design Lab may be a corner of a classroom, a portable cart, or a separate room.

Background Papers: These papers, correlated with the "How To" Series, provide teachers with information and hints that do not appear in the student materials.

Curriculum Correlation Guide: By correlating the twenty-six USMES units with other curriculum materials, this book helps teachers integrate USMES with other school activities and lessons.

The "How To" Series is a resource developed by the USMES project. Earle L. Lomon, Project Director, Betty M. Beck, Associate Director for Development, Thomas L. Brown, Associate Director for Utilization Studies, Quinton E. Baker, Associate Director for Administration.

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Complete USMES Library ISBN 0-89292-033-5
Beginning "How To" Series ISBN 0-89292-029-7

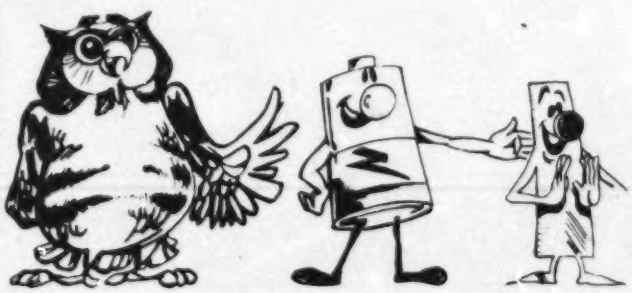
THE USMES BEGINNING "HOW TO" SERIES

USMES and Skills

USMES students often see a need to learn new skills to help them get a problem-solving job done. Children seeking to improve a street crossing may want to learn how to use a stopwatch or how to make a trundle wheel. Children comparing different brands of paper towels may want to learn how to design an experiment and how to make a bar graph. The list can go on and on, but the pattern is clear; solving a real problem requires skills.

Purpose of 'How To' Series

Written resources that help children learn skills like designing an opinion survey and choosing the appropriate measuring tool are not readily available for elementary school students. However, the USMES "How To" Series fills this gap. Its cartoon-style format helps younger children and those with reading difficulties acquire the skills and knowledge they need to do things like redesign their classroom, find the best buy in potato chips, or run a school store.



How to Use the 'How To' Series

Wait for a need. When a student asks for help, refer him or her to the appropriate booklet. Having a child read a booklet before there is a need to do so will not only result in less effective learning but will defeat the USMES purpose of allowing children to decide what needs to be done.

When necessary, use the "How To" Series as a teaching aid. Most of the time children will be able to go through a booklet by themselves and learn the skills they need to learn. However, some material in some sets is difficult and somewhat abstract. Such sections are usually towards the ends of booklets and often labeled "extra." When the booklet by itself is not doing the job, feel free to step in and help the student go through it.

Knowing how the content of the booklets are organized may help in using the series effectively.

- Each cover page summarizes what is in the booklet by illustrating the general problem and solution.
- Each booklet contains several examples of children using the skill being taught. Each example emphasizes a different aspect of the skill or a potential pitfall.
- Where a skill covered in one booklet is used in another, there is a reference in the form: See "How To...."

OTHER USMES 'HOW TO' SERIES

Intermediate "How To" Series: This magazine-style series covers in more detail essentially the same material as the cartoon-style series with a few booklets on additional skills. This series gives students a chance to read something they have a need to read.

Design Lab "How To" Series: These illustrated cards help children learn how to use tools safely and effectively.

"How To" Cards: These cards are printed on colored card stock rather than paper as the other series are. They contain fewer words than the *Intermediate "How To" Series* and utilize the American system of units (ft.-lb.-sec.) rather than the metric system.

BEGINNING "HOW TO" SERIES

BIOLOGY

How To
- Make a Home for Your Animal
- Make a Home for Your Rodent

COLLECTING DATA

How To
- Record Data
- Do an Experiment
- Make an Opinion Survey
- Choose a Sample

ELECTRICITY

How To
- Make Simple Circuits
- Make a Circuit Stay Together
- Add Things to a Circuit
- Make and Use Switches
- Fix a Circuit

GRAPHING

How To
- Choose Which Graph to Make
- Make a Bar Graph
- Make a Bar Graph Histogram
- Make a Conversion Graph
- Make a Line Chart
- Make a Line Graph
- Make a Scatter Graph
- Make a Slope Diagram

MEASURING

How To
- Use a Stopwatch
- Choose the Right Tool to Measure Distance
- Use a Trundle Wheel
- Make a Scale Drawing
- Find the Speed of Things

SIMPLIFYING DATA

How To
- Round Off Data
- Find the Median
- Find the Average

edc

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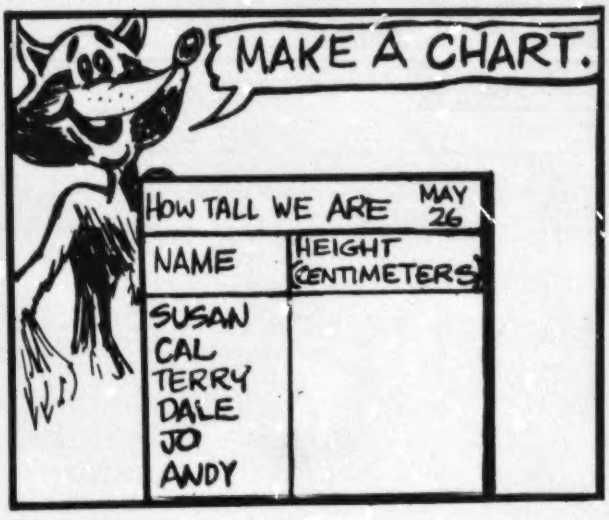
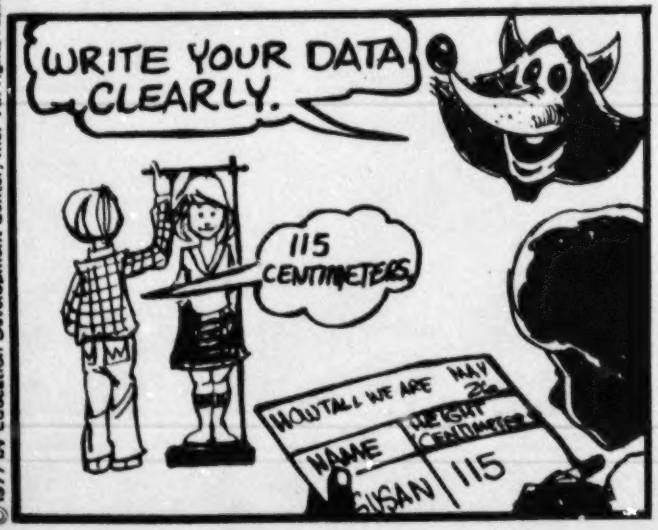
HOW TO

RECORD DATA

USMES
UNIFIED SCIENCES AND MATHEMATICS FOR ELEMENTARY SCHOOLS





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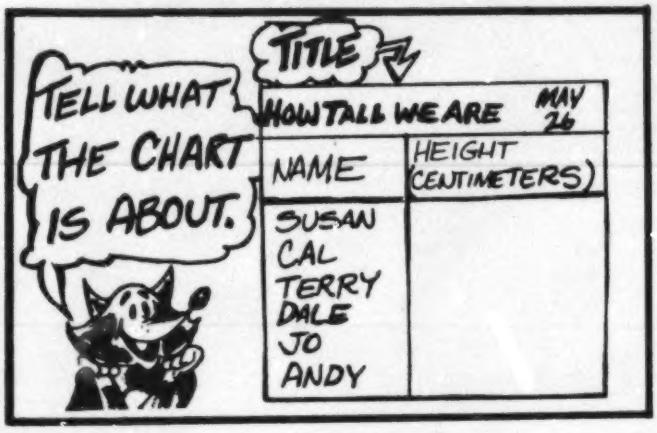
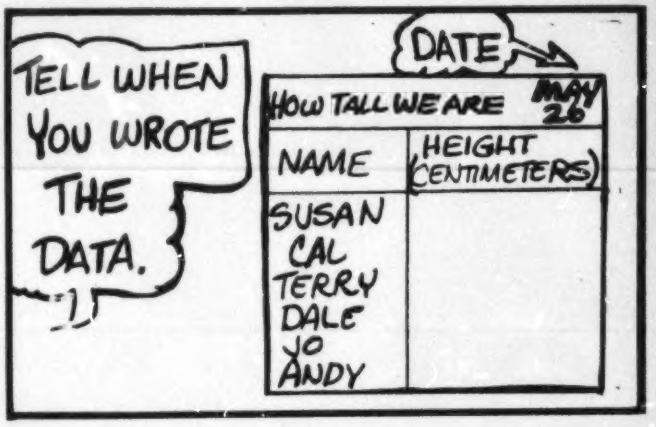
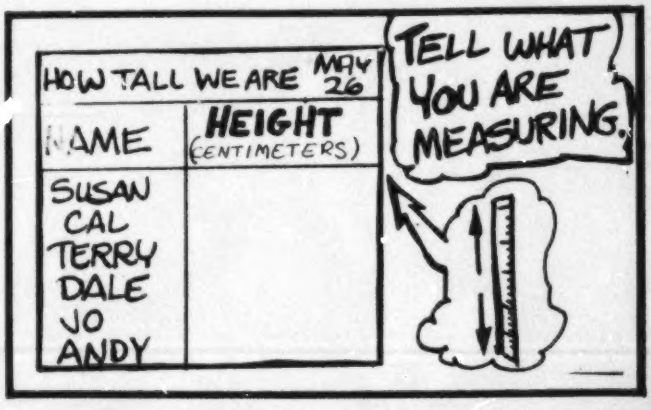
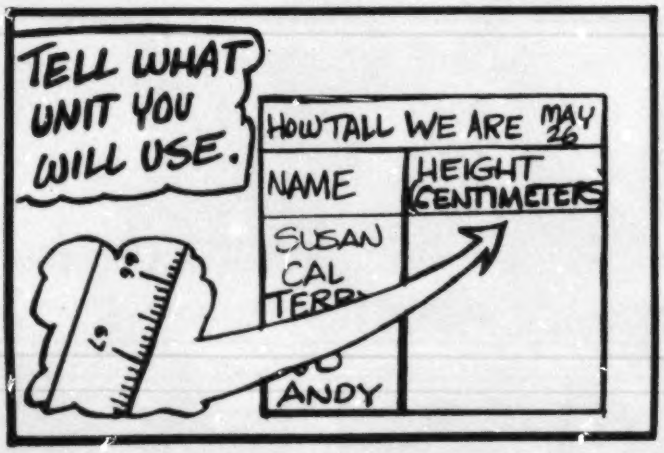
HERE ARE SOME THINGS YOU SHOULD PUT ON A CHART LIKE THIS.

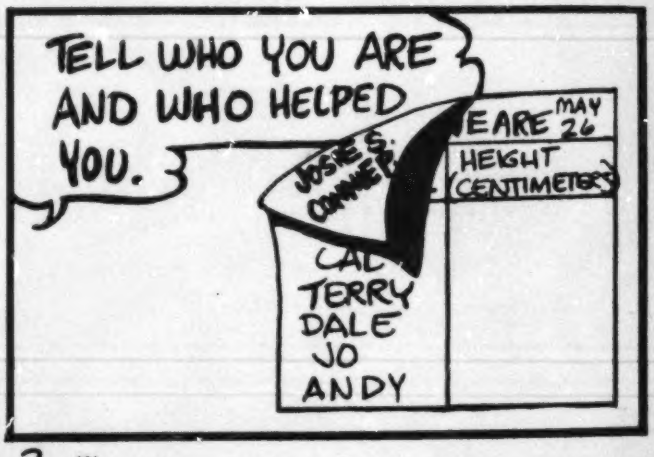

TELL WHAT THE CHART IS ABOUT.
TITLE
HOW TALL WE ARE MAY 26
NAME
HEIGHT (CENTIMETERS)
SUSAN
CAL
TERRY
DALE
JO
ANDY


TELL WHEN YOU WROTE THE DATA.
DATE
HOW TALL WE ARE MAY 26
NAME
HEIGHT (CENTIMETERS)
SUSAN
CAL
TERRY
DALE
JO
ANDY

TELL WHO YOU ARE MEASURING.
HOW TALL WE ARE MAY 26
NAME
HEIGHT (CENTIMETERS)
SUSAN
CAL
TERRY
DALE
JO
ANDY


HOW TALL WE ARE MAY 26
NAME
HEIGHT (CENTIMETERS)
SUSAN
CAL
TERRY
DALE
JO
ANDY
TELL WHAT YOU ARE MEASURING.


TELL WHAT UNIT YOU WILL USE.
HOW TALL WE ARE MAY 26
NAME
HEIGHT (CENTIMETERS)
SUSAN
CAL
TERRY
ANDY


TELL WHO YOU ARE AND WHO HELPED YOU.
JOSIE'S CAMERA
WE ARE MAY 26
HEIGHT (CENTIMETERS)
CAL
TERRY
DALE
JO
ANDY

EXAMPLE

I LIKE THIS BEST.

HOW DO I RECORD THAT?

COLA
ORANGE
GRAPE
CHERRY

MAKE A CHART LIKE THIS FOR YOUR DATA.

DRINK SURVEY OCT. 7	
FLAVOR	HOW MANY CHOSE IT
COLA	
ORANGE	
GRAPE	
CHERRY	

I LIKE GRAPE.

DRINK SURVEY OCT. 7	
FLAVOR	HOW MANY CHOSE IT
COLA	
ORANGE	
GRAPE	I
CHERRY	

ORANGE

DRINK SURVEY OCT. 7	
FLAVOR	HOW MANY CHOSE IT
COLA	
ORANGE	I
GRAPE	I
CHERRY	

GRAPE

DRINK SURVEY OCT 7	
FLAVOR	HOW MANY CHOSE IT
COLA	
ORANGE	I
GRAPE	II
CHERRY	

LATER...

4

DRINK SURVEY OCT 7	
FLAVOR	HOW MANY CHOSE IT
COLA	II
ORANGE	I
GRAPE	IIII
CHERRY	I

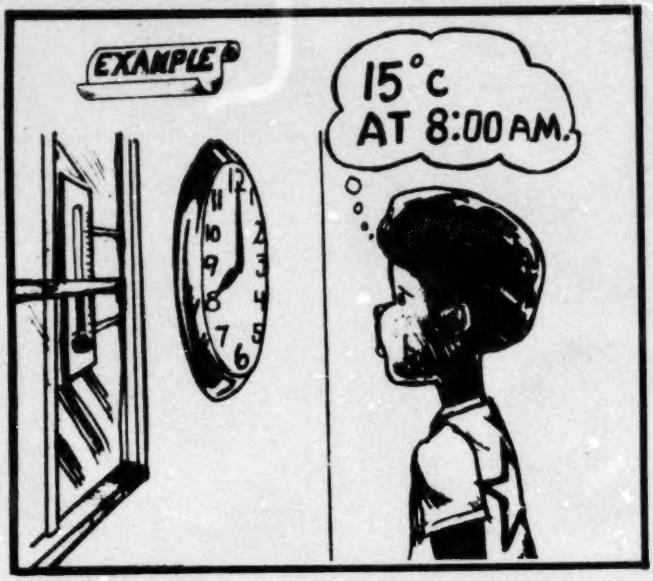
GRAPE

5

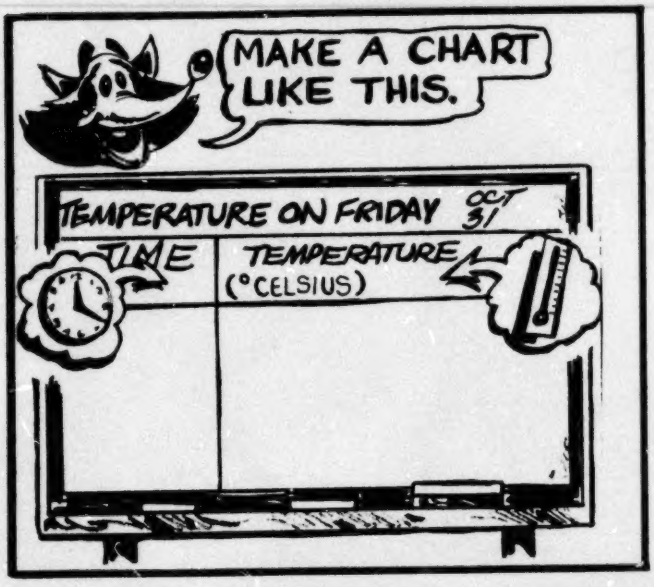
GRAPE	IIII

LATER...

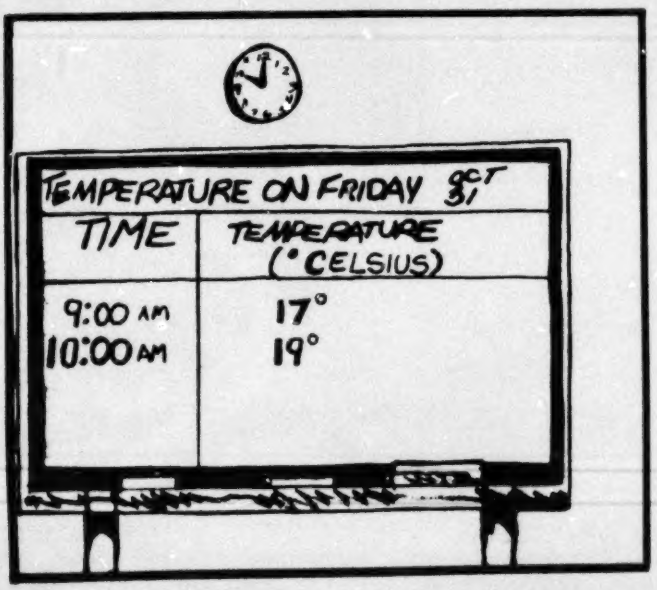
DRINK SURVEY OCT 7	
FLAVOR	HOW MANY CHOSE IT
COLA	IIII III ⑧
ORANGE	IIII II ⑦
GRAPE	IIII IIII II ⑫
CHERRY	III ③

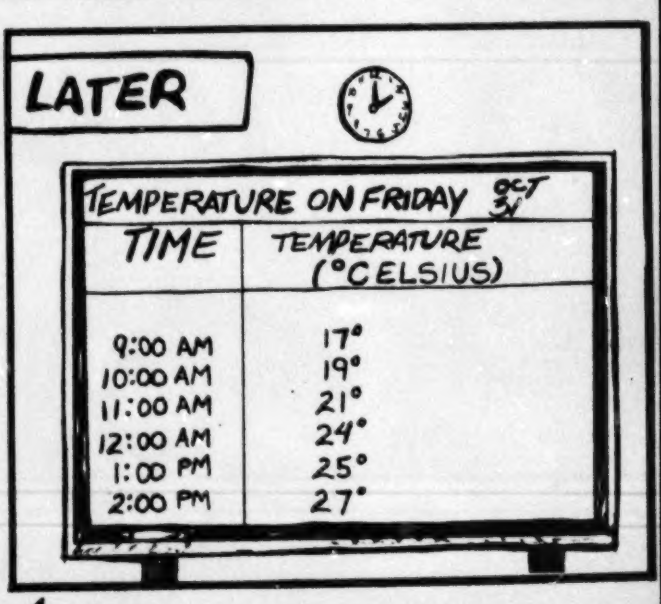

EXAMPLE
15°C
AT 8:00 AM.

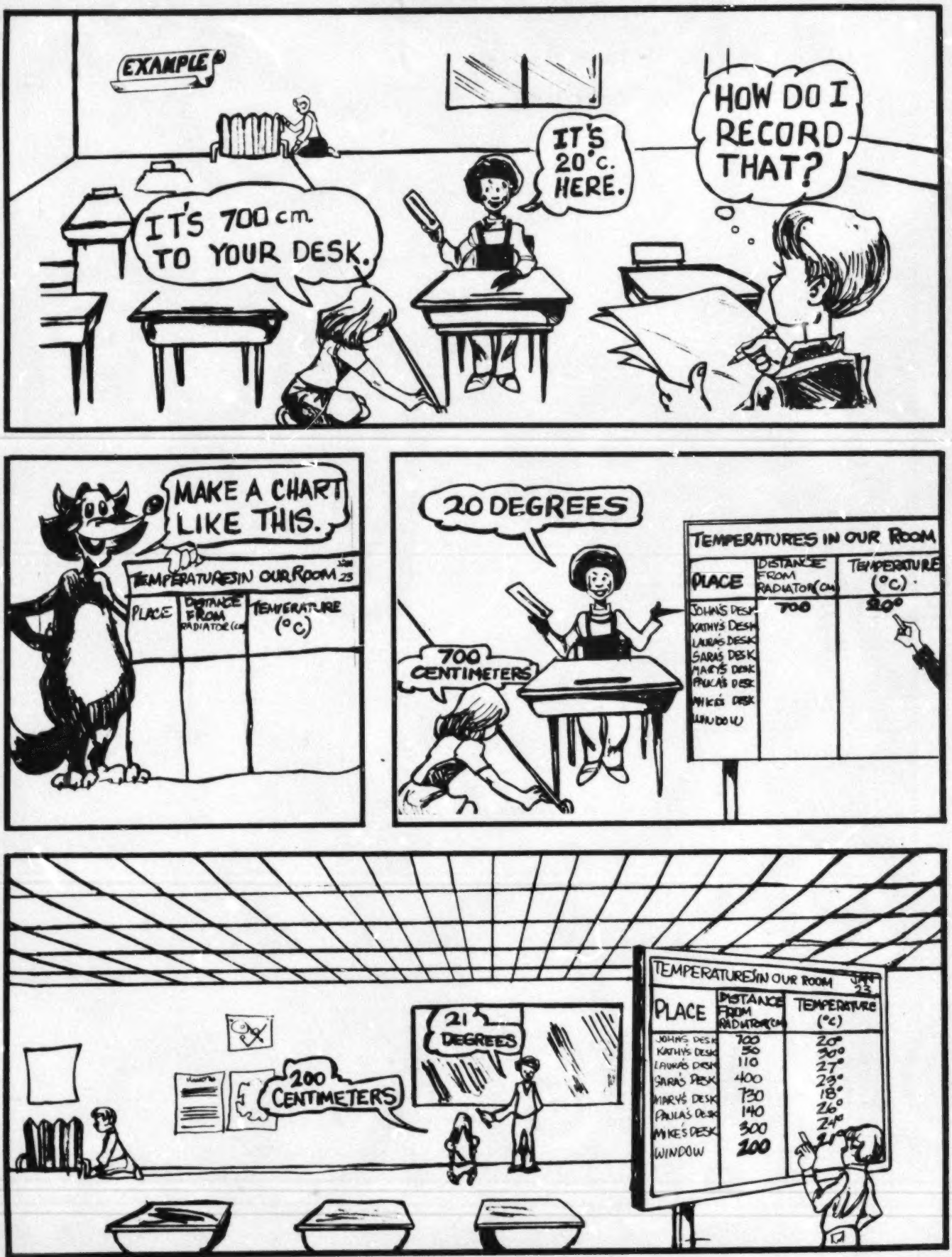
HOW DO I
RECORD THAT?


MAKE A CHART
LIKE THIS.
TEMPERATURE ON FRIDAY OCT 31
TIME
TEMPERATURE
(°CELSIUS)

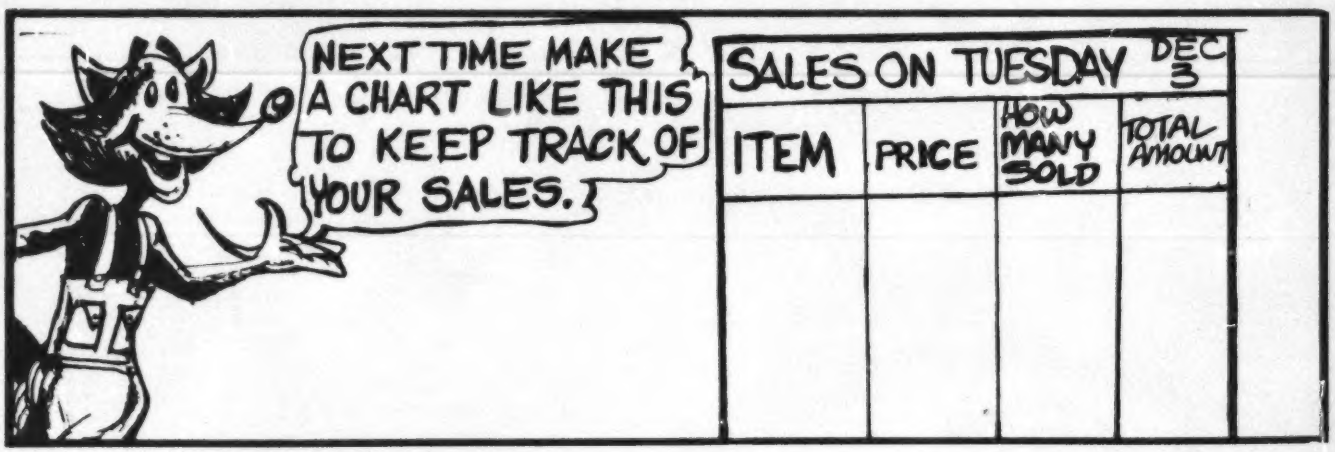
TEMPERATURE ON FR
TIME
TEMPERATU
(°CELSIUS)
9:00 AM
17°
ITS 9:00 AM
AND IT'S
17°.


TEMPERATURE ON FRIDAY OCT 31
TIME
TEMPERATURE
(°CELSIUS)
9:00 AM
17°
10:00 AM
19°


LATER
TEMPERATURE ON FRIDAY OCT 31
TIME
TEMPERATURE
(°CELSIUS)
9:00 AM
17°
10:00 AM
19°
11:00 AM
21°
12:00 AM
24°
1:00 PM
25°
2:00 PM
27°


EXAMPLE
IT'S 700 cm. TO YOUR DESK.
IT'S 20°C. HERE.
HOW DO I RECORD THAT?
MAKE A CHART LIKE THIS.
TEMPERATURES IN OUR ROOM
PLACE
DISTANCE FROM RADIATOR (cm)
TEMPERATURE (°C)
20 DEGREES
700 CENTIMETERS
JOHN'S DESK
KATHY'S DESK
LAURA'S DESK
SARA'S DESK
MARY'S DESK
PAULA'S DESK
MIKE'S DESK
WINDOW
21 DEGREES
200 CENTIMETERS

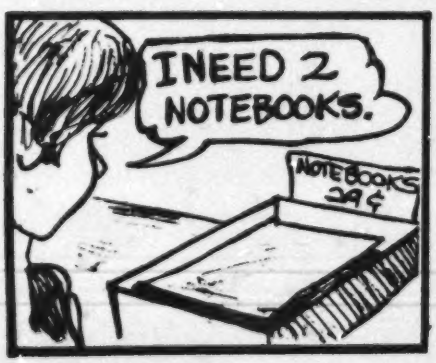
WHAT DID WE SELL TODAY?
HOW MUCH MONEY DID WE GET?
I DONT KNOW!
EXAMPLE
SCHOOL STORE


NEXT TIME MAKE A CHART LIKE THIS TO KEEP TRACK OF YOUR SALES.
SALES ON TUESDAY DEC 3
ITEM
PRICE
HOW MANY SOLD
TOTAL AMOUNT

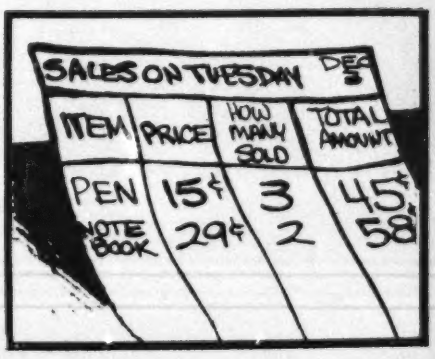
NEXT DAY...
PENS
I WANT 3 PENS.

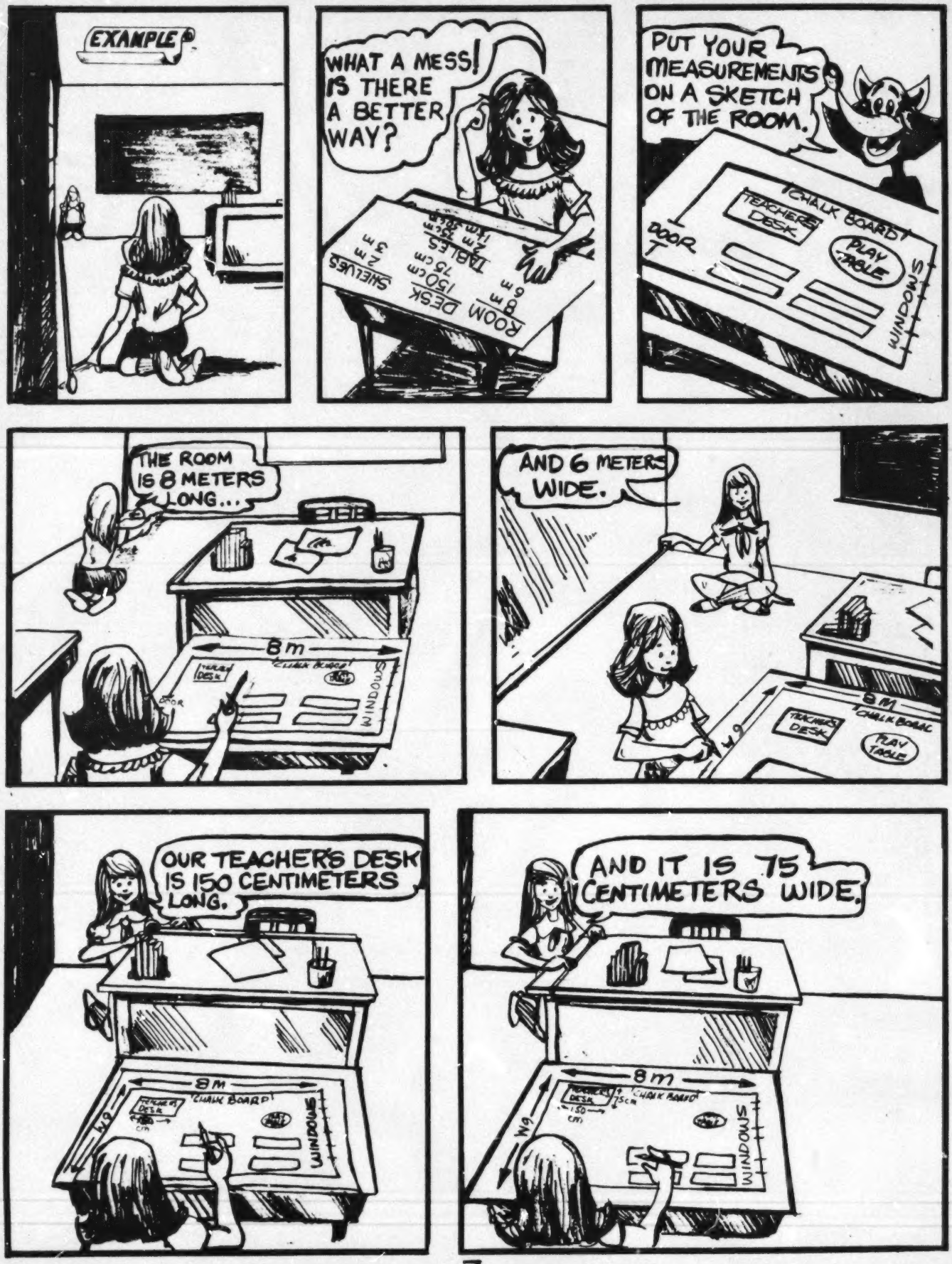
THAT WILL BE 45 CENTS.
15¢
15¢
15¢
45¢ TOTAL

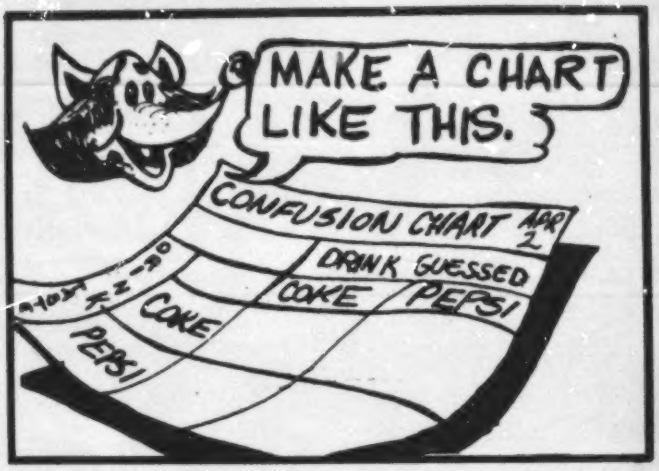
SALES ON TUESDAY DEC 3
ITEM
PRICE
HOW MANY SOLD
TOTAL AMOUNT
PEN
15¢
3
45¢

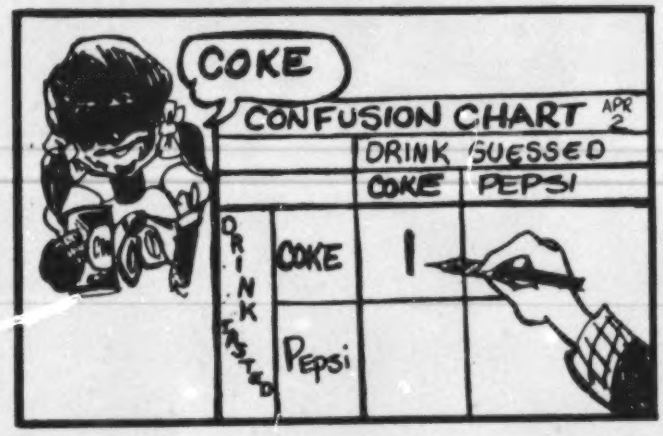

INEED 2 NOTEBOOKS.
NOTEBOOKS 29¢

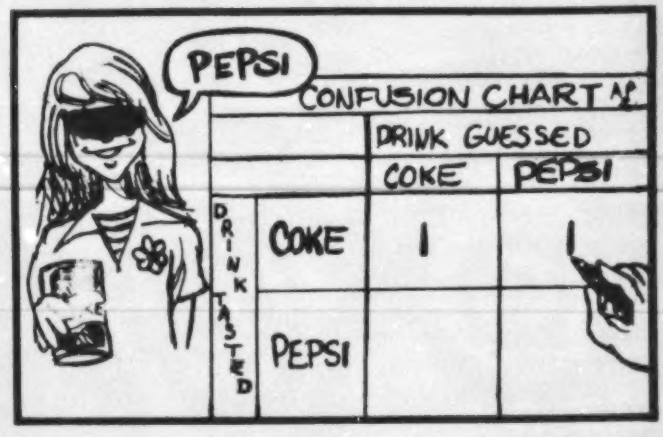
THAT WILL BE 58 CENTS.
29¢
29¢
58¢ TOTAL

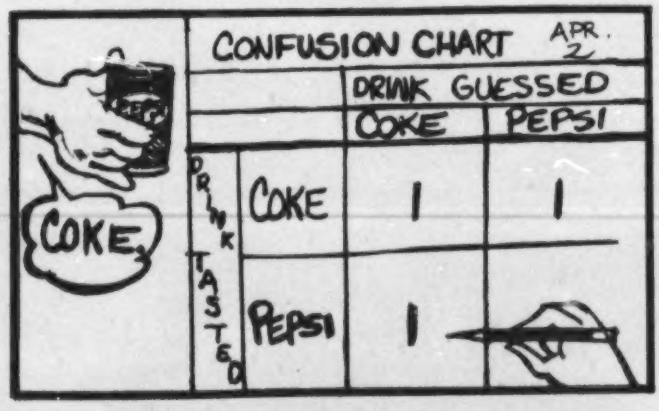

SALES ON TUESDAY DEC 3
ITEM
PRICE
HOW MANY SOLD
TOTAL AMOUNT
PEN
15¢
3
45¢
NOTE BOOK
29¢
2
58¢

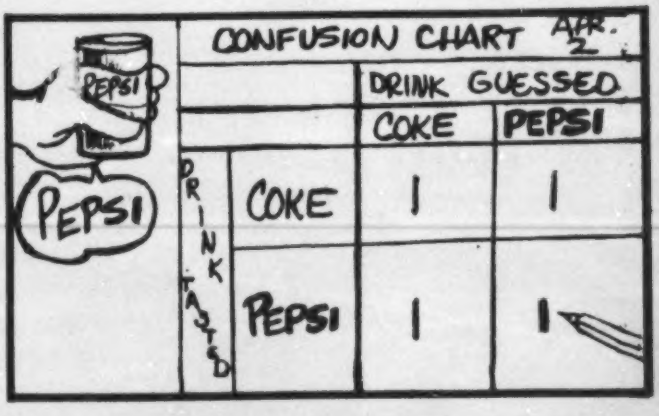

EXAMPLE
WHAT A MESS! IS THERE A BETTER WAY?
ROOM 8m 6m
DESK 150cm 75cm
TABLES 2m 75cm 1m 50cm
SHELVES 2m 3m
PUT YOUR MEASUREMENTS ON A SKETCH OF THE ROOM.
CHALK BOARD
TEACHERS DESK
PLAY TABLE
DOOR
WINDOWS
THE ROOM IS 8 METERS LONG...
8m
AND 6 METERS WIDE.
6m
OUR TEACHER'S DESK IS 150 CENTIMETERS LONG.
AND IT IS 75 CENTIMETERS WIDE.

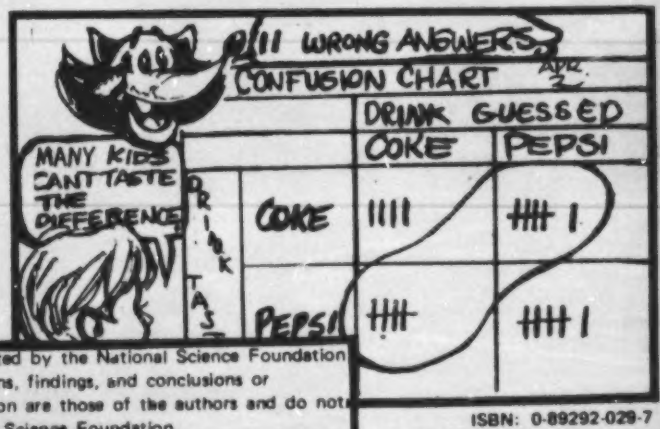












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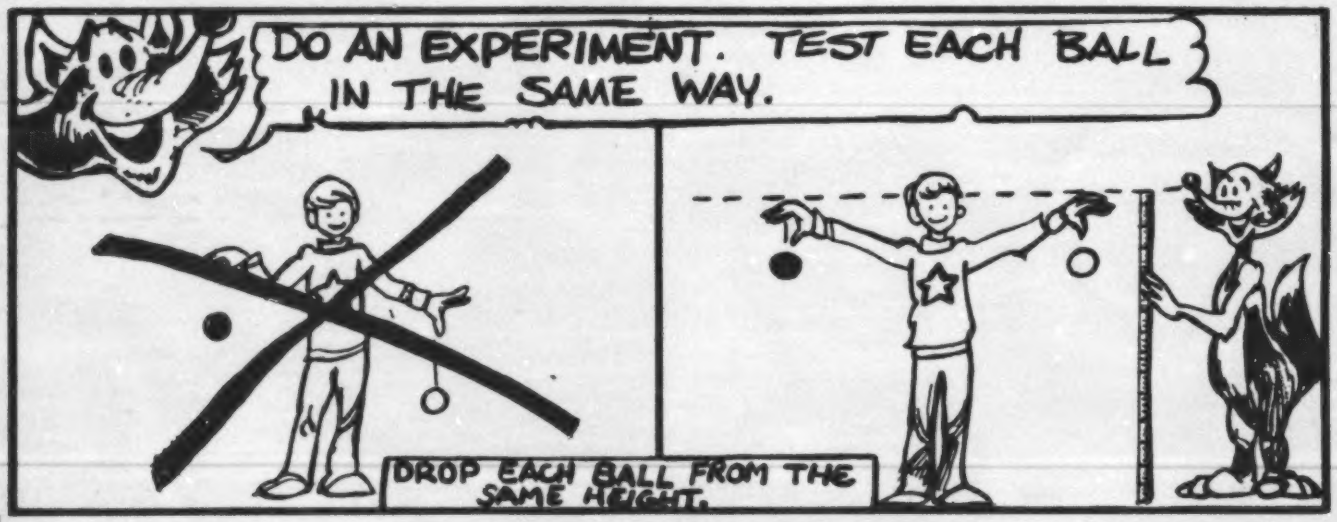
HOW TO

DO AN EXPERIMENT

USMES
UNIFIED SCIENCES AND MATHEMATICS FOR ELEMENTARY SCHOOLS



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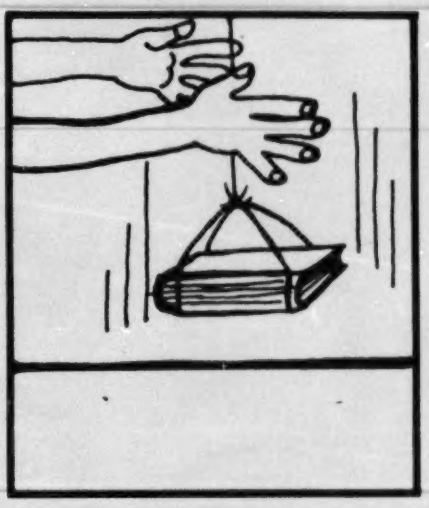
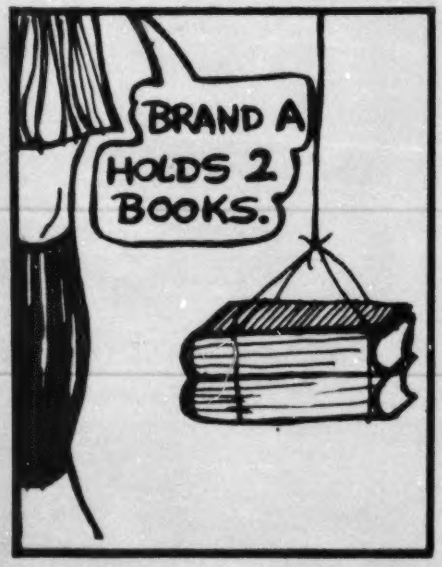
EXAMPLE
HOW FAR?
←?→
6 METERS
6½ METERS
7 METERS
IT's 6 METERS.
NO, IT's 6½ METERS.
IT's 7 METERS.
YOU MEASURED 3 DIFFERENT DISTANCES.
MEASURE THE SAME WAY.
6 METERS
6 METERS
6 METERS
6M

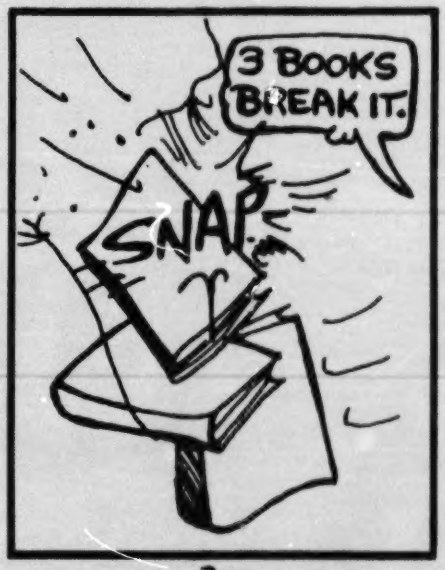
EXAMPLE
WHICH STRING IS STRONGER, BRAND A OR BRAND B?
A
B
A
B
WE'LL TEST THEM BY DROPPING BOOKS TIED TO THEM.

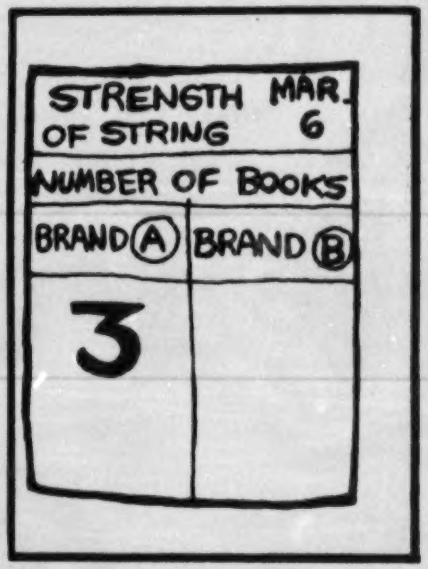
A



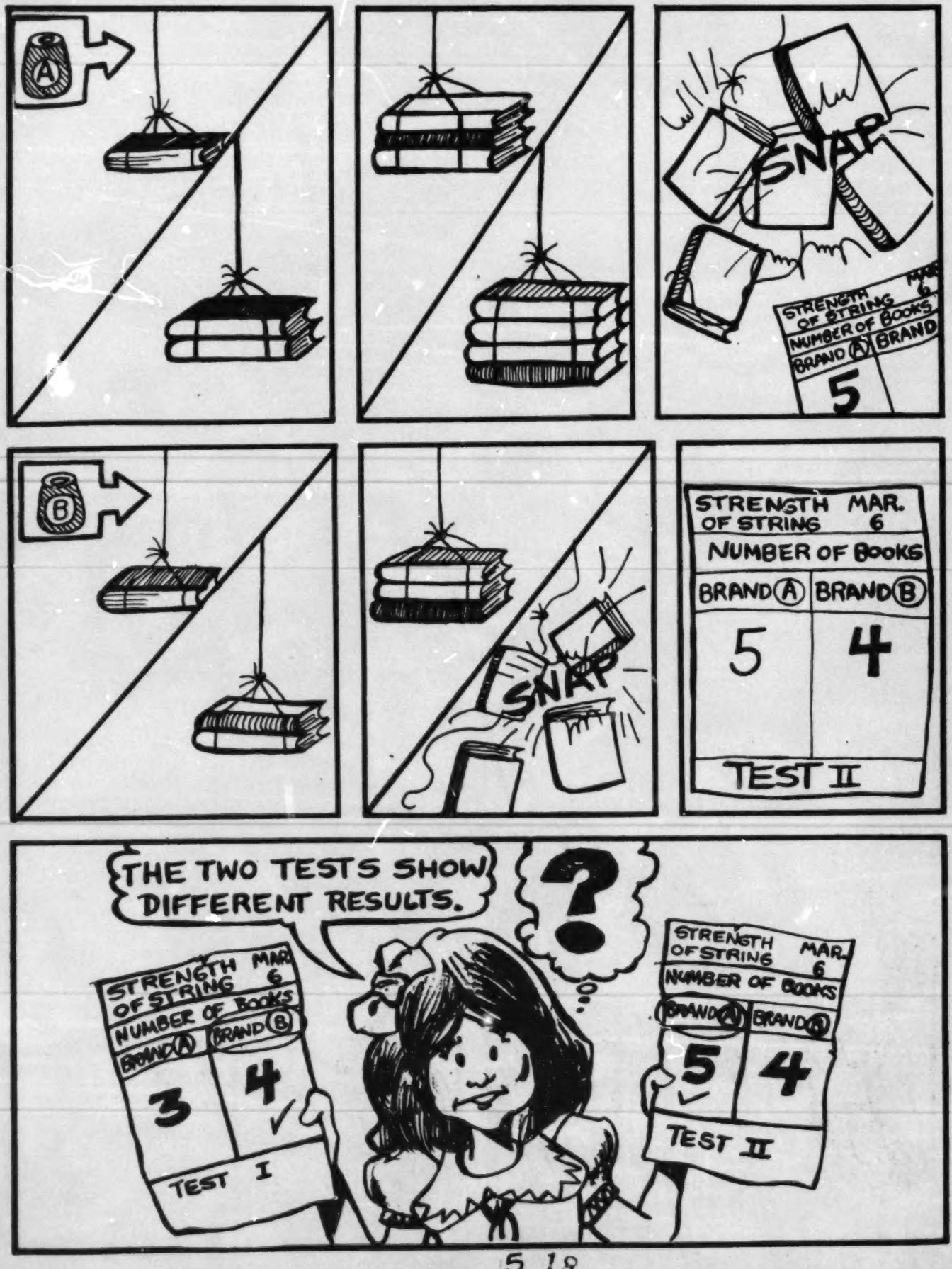
BRAND A HOLDS ONE BOOK.

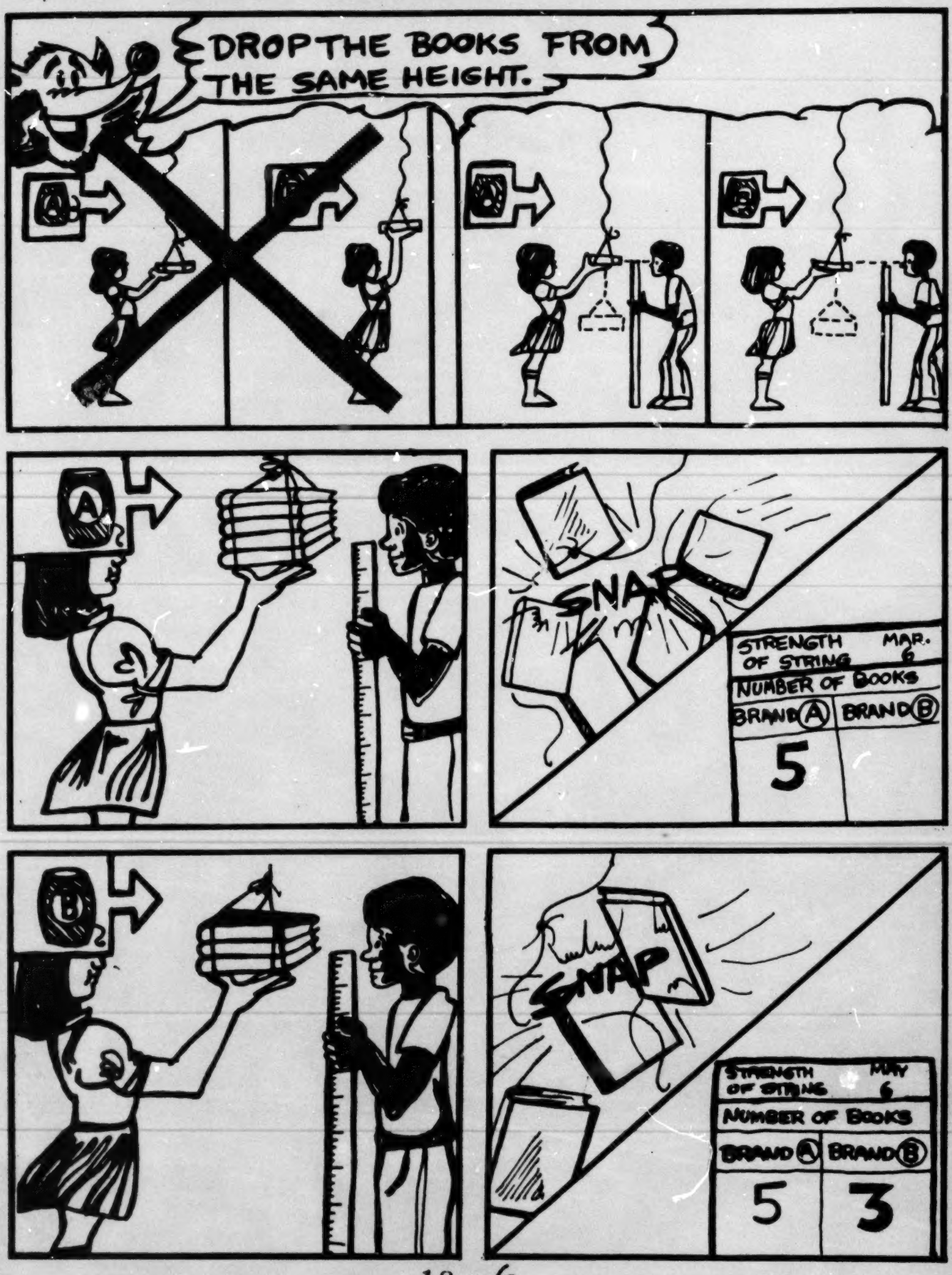

BRAND A HOLDS 2 BOOKS.

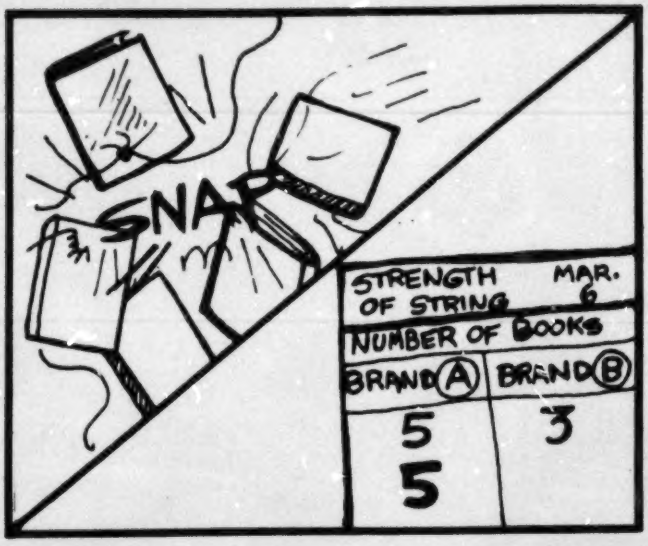

3 BOOKS BREAK IT.
SNAP

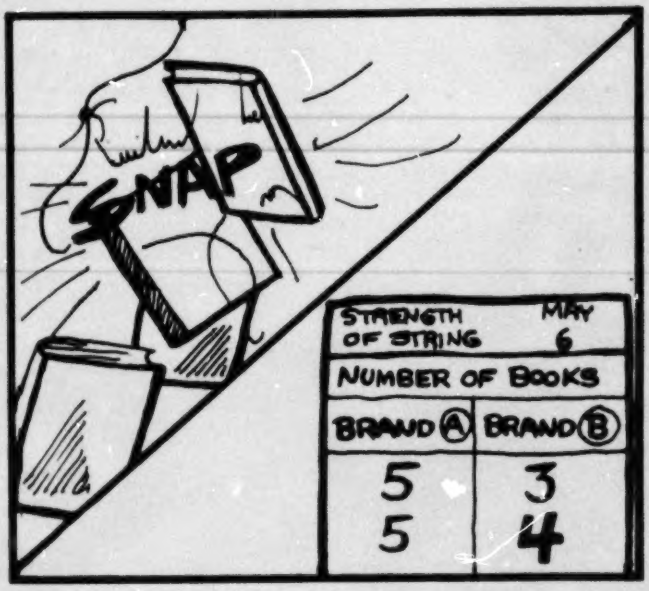

STRENGTH OF STRING
MAR. 6
NUMBER OF BOOKS
BRAND A
BRAND B
3

B
BRAND B HOLDS ONE BOOK.
2
3
4 BOOKS BREAK IT.
SNAP
STRENGTH OF STRING MAR. 6
NUMBER OF BOOKS
BRAND A
BRAND B
3
4
STRENGTH OF STRING MAR. 6
NUMBER OF BOOKS
BRAND A
BRAND B
3
4
B IS STRONGER.
B
YOU SHOULD DO MORE THAN ONE TEST.


A
SNAP
STRENGTH OF STRING MAR. 6
NUMBER OF BOOKS
BRAND A
BRAND
5
B
SNAP
STRENGTH OF STRING MAR. 6
NUMBER OF BOOKS
BRAND A
BRAND B
5
4
TEST II
THE TWO TESTS SHOW DIFFERENT RESULTS.
?
STRENGTH OF STRING MAR. 6
NUMBER OF BOOKS
BRAND A
BRAND B
3
4
TEST I
STRENGTH OF STRING MAR. 6
NUMBER OF BOOKS
BRAND A
BRAND B
5
4
TEST II

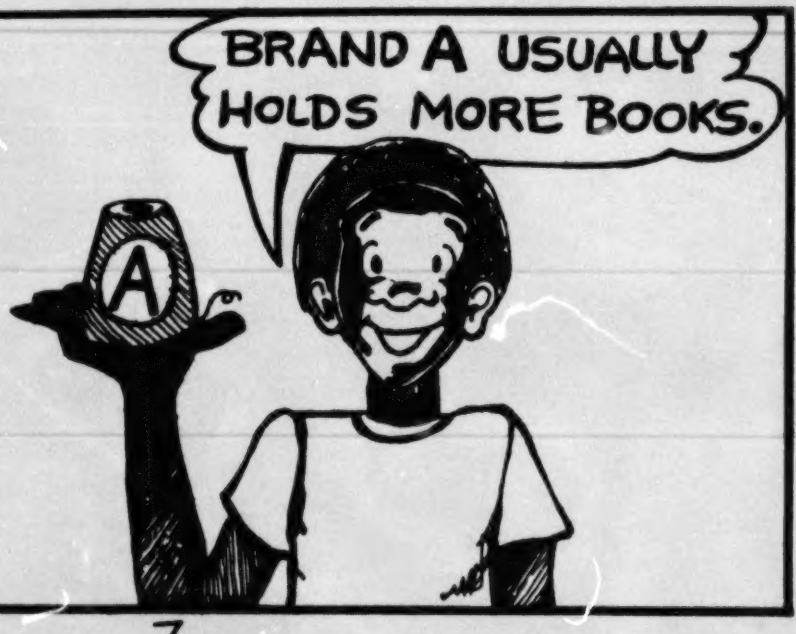

DROP THE BOOKS FROM THE SAME HEIGHT.
A
B
SNAP
STRENGTH OF STRING MAR. 6
NUMBER OF BOOKS
BRAND (A)
BRAND (B)
5
SNAP
STRENGTH OF STRING MAY 6
NUMBER OF BOOKS
BRAND (A)
BRAND (B)
5
3



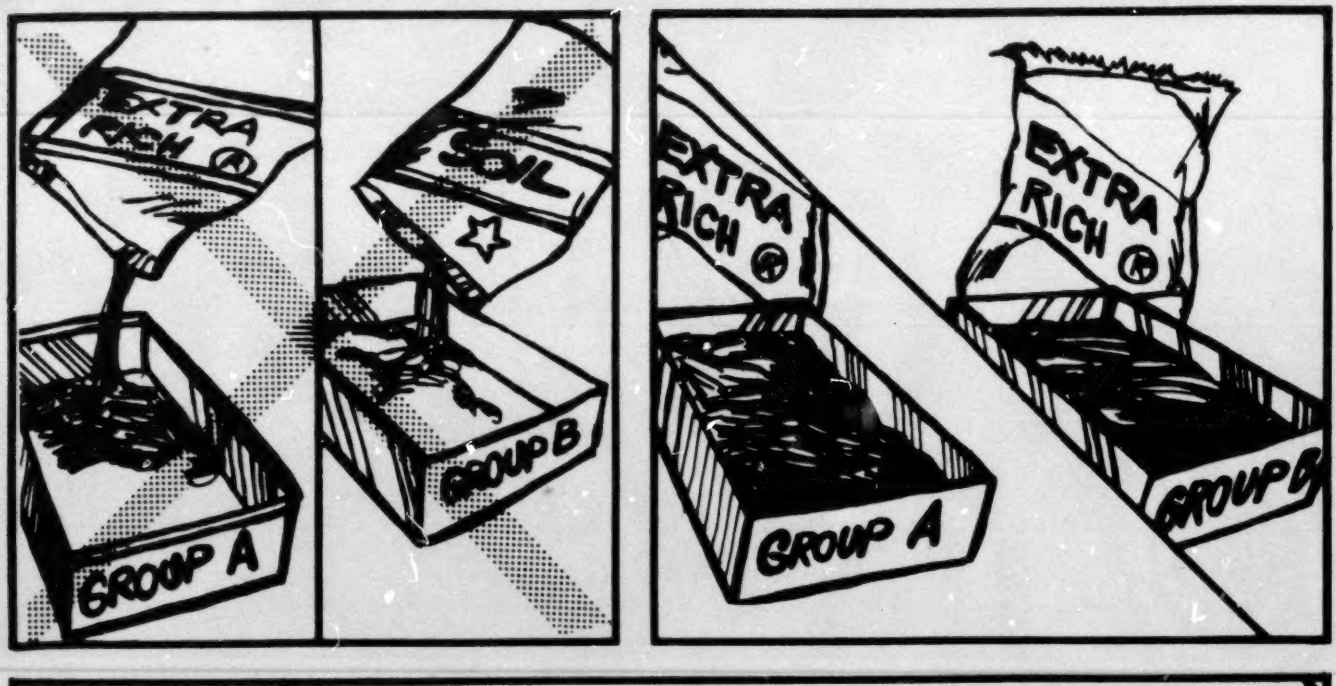


LATER

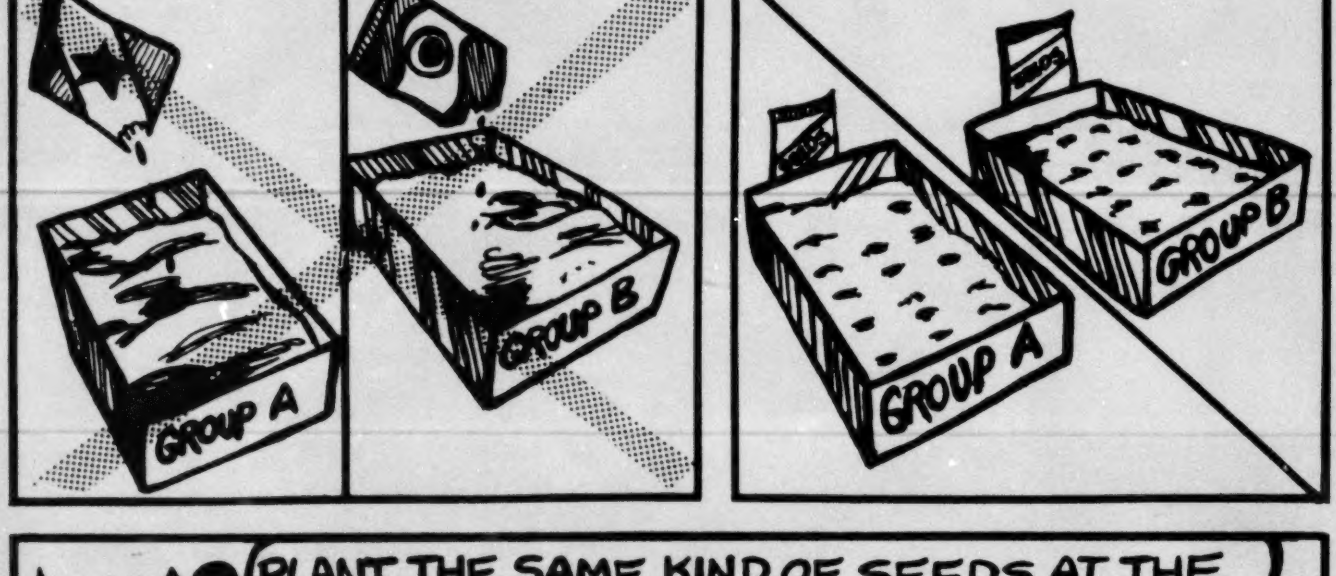
STRENGTH OF STRING	MAR. 6
NUMBER OF BOOKS	
BRAND A	BRAND B
5	3
5	4
6	5
4	4
7	5



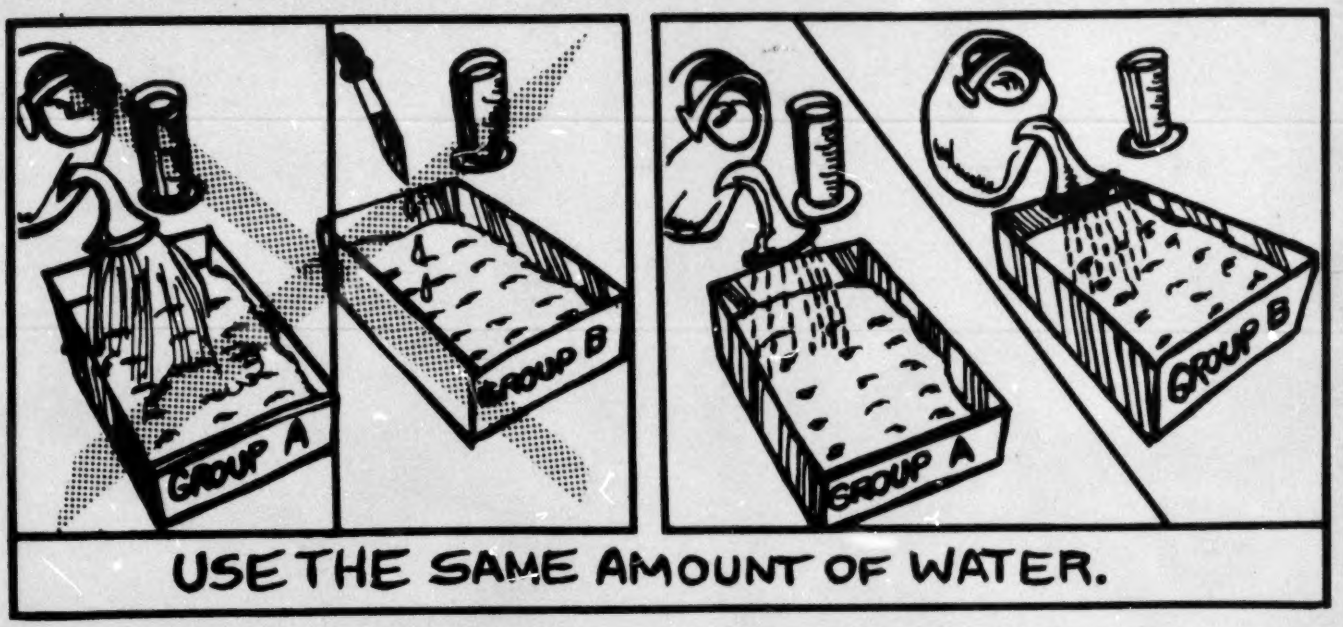
EXAMPLE
DO PLANTS GROW BETTER IN THE SUNLIGHT?
DO A TEST WITH TWO GROUPS OF SEEDS.
GROUP A
GROUP B
PLANT ENOUGH SEEDS, NOT JUST ONE OR TWO.
GROUP B
GROUP A
SOIL
SEEDS
WATER
SUNLIGHT
WATCH THESE THINGS.
IF YOU WANT TO FIND OUT ABOUT SUNLIGHT...
KEEP THESE THINGS THE SAME.
SOIL
SEEDS
WATER
SUNLIGHT



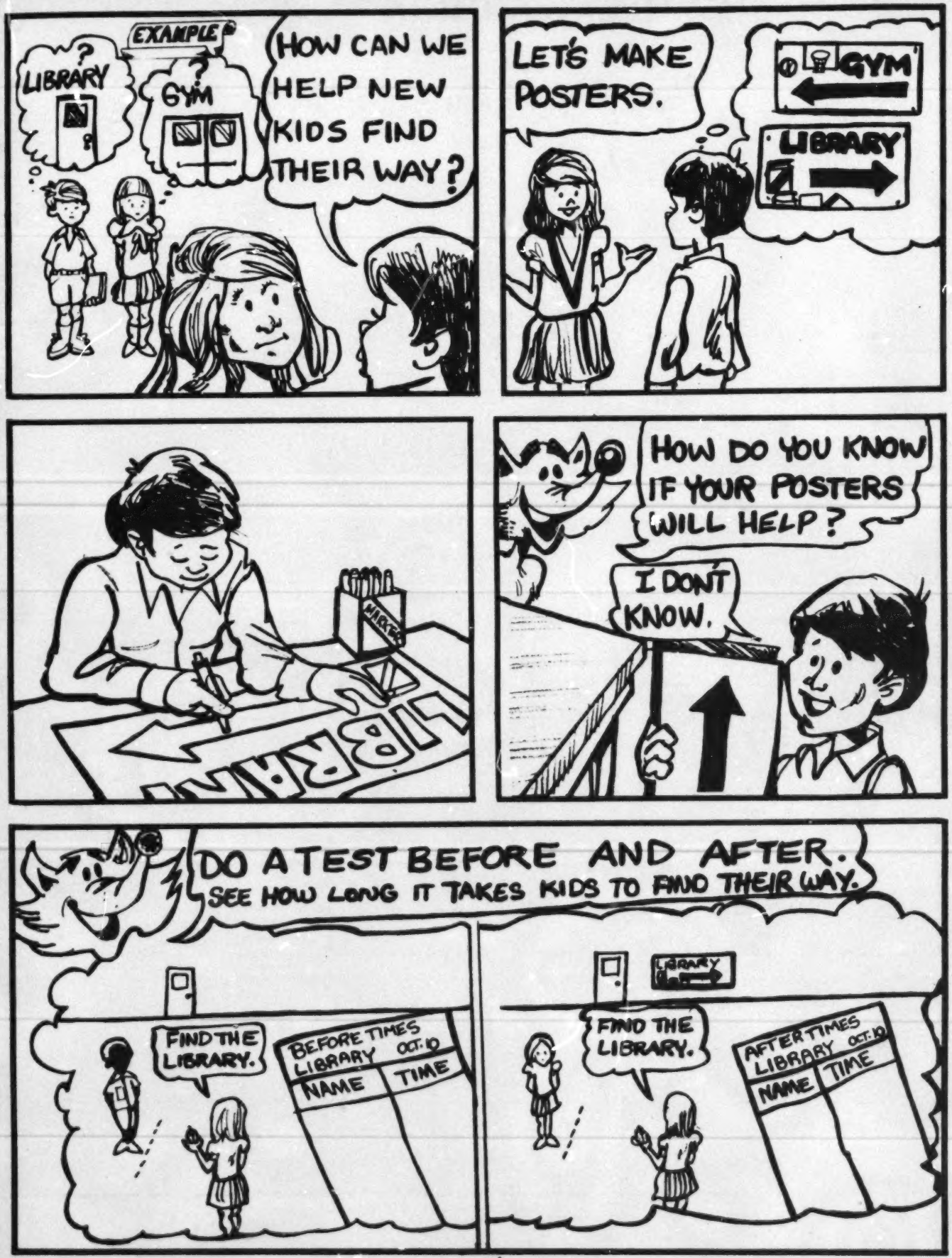
USE THE SAME KIND AND AMOUNT OF SOIL IN THE SAME SIZE BOXES.

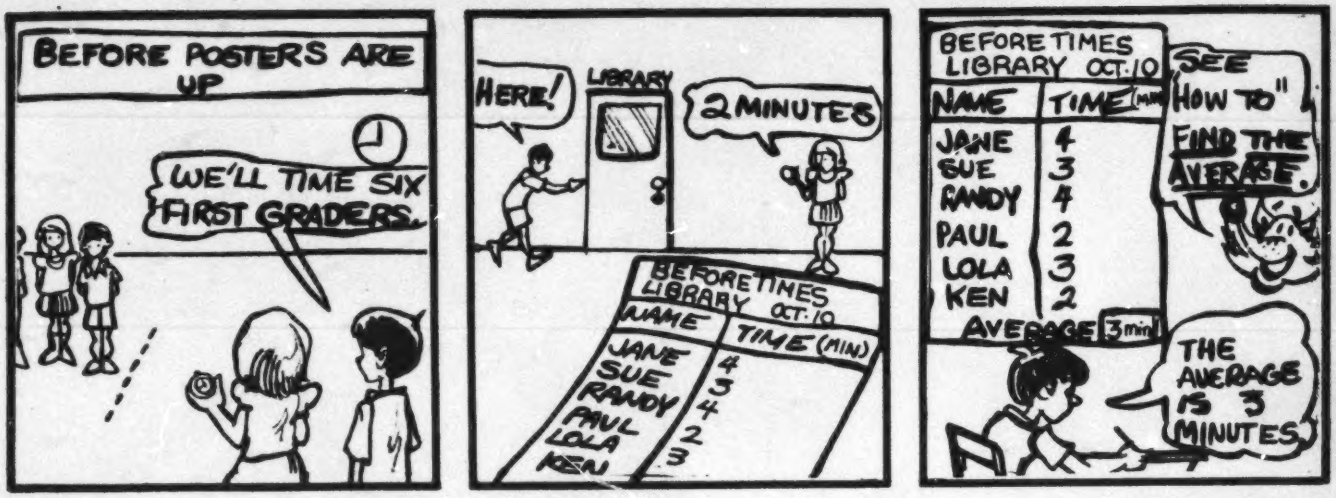


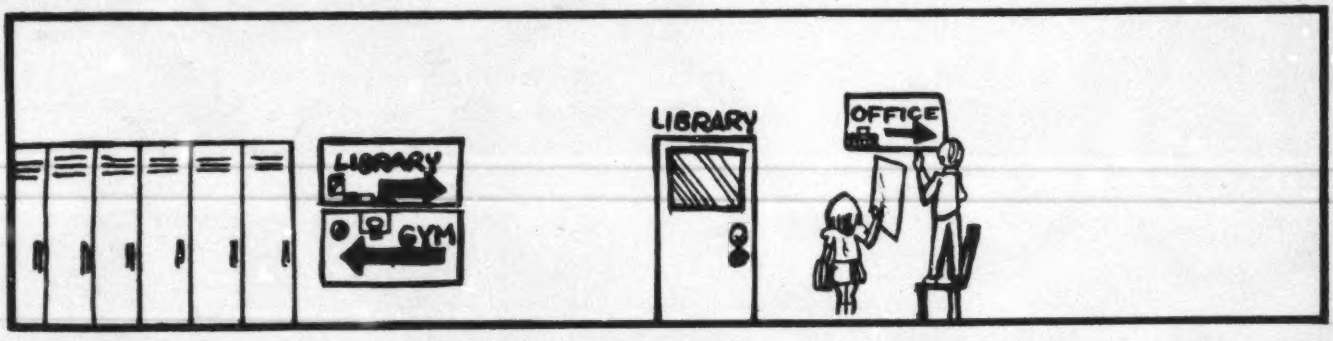
PLANT THE SAME KIND OF SEEDS AT THE SAME DISTANCE AND AT THE SAME DEPTH.

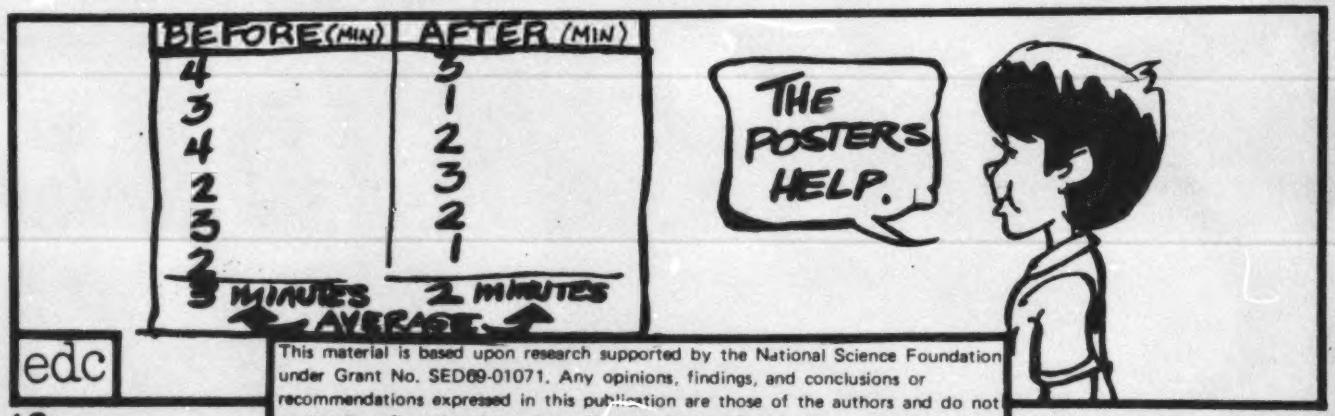


USE THE SAME AMOUNT OF WATER.


EXAMPLE
LIBRARY ?
GYM ?
HOW CAN WE HELP NEW KIDS FIND THEIR WAY?
LET'S MAKE POSTERS.
GYM
LIBRARY
LIBRARY
HOW DO YOU KNOW IF YOUR POSTERS WILL HELP?
I DON'T KNOW.
DO A TEST BEFORE AND AFTER.
SEE HOW LONG IT TAKES KIDS TO FIND THEIR WAY.
FIND THE LIBRARY.
BEFORE TIMES LIBRARY OCT. 10
NAME
TIME
LIBRARY
FIND THE LIBRARY.
AFTER TIMES LIBRARY OCT. 10
NAME
TIME







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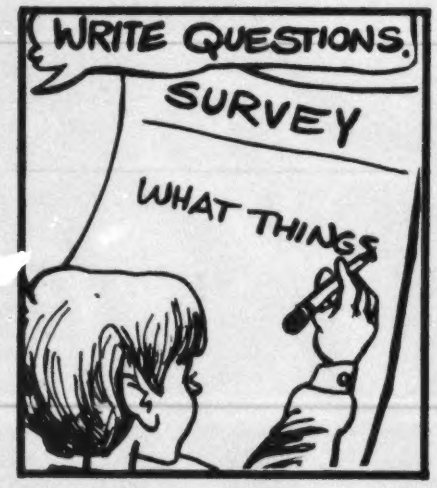
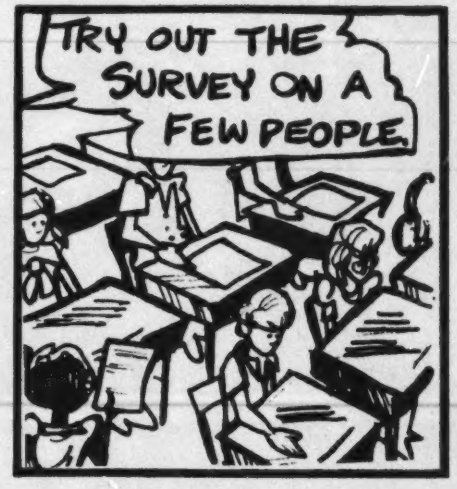
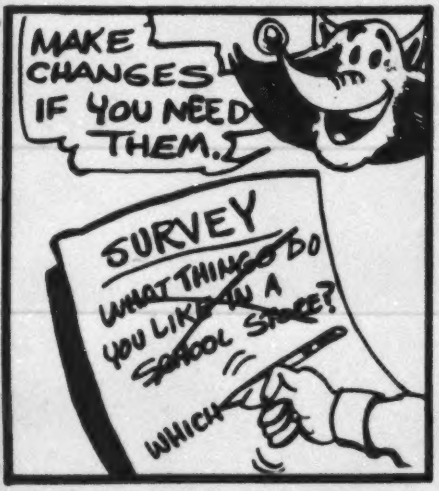
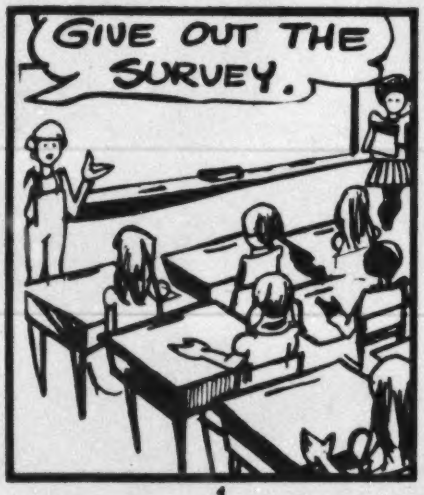
HOW TO

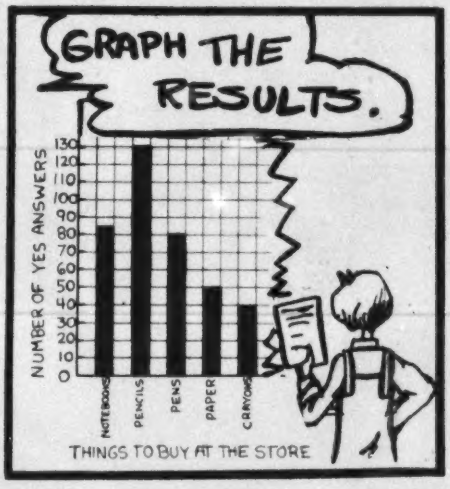
MAKE AN OPINION SURVEY











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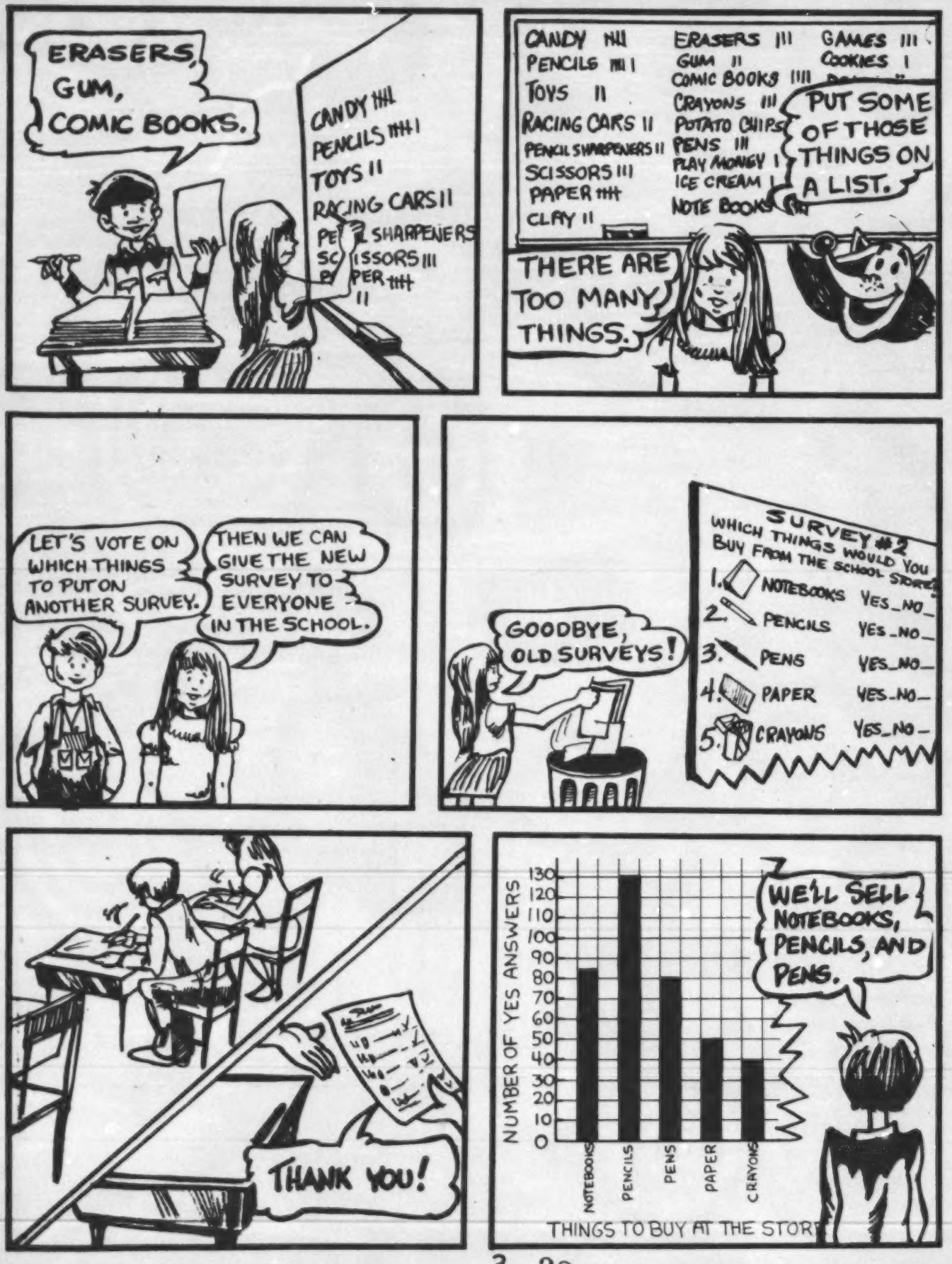
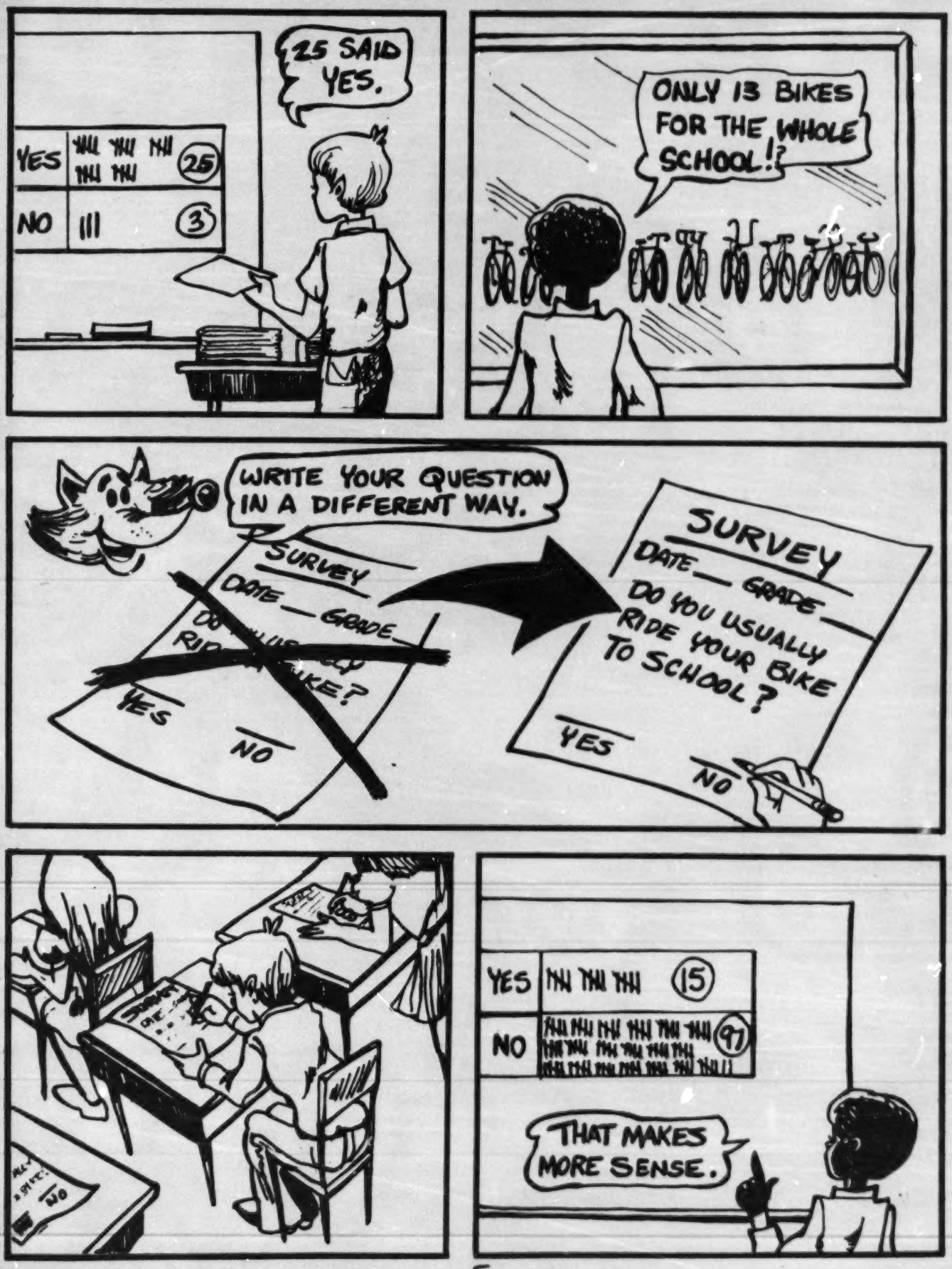
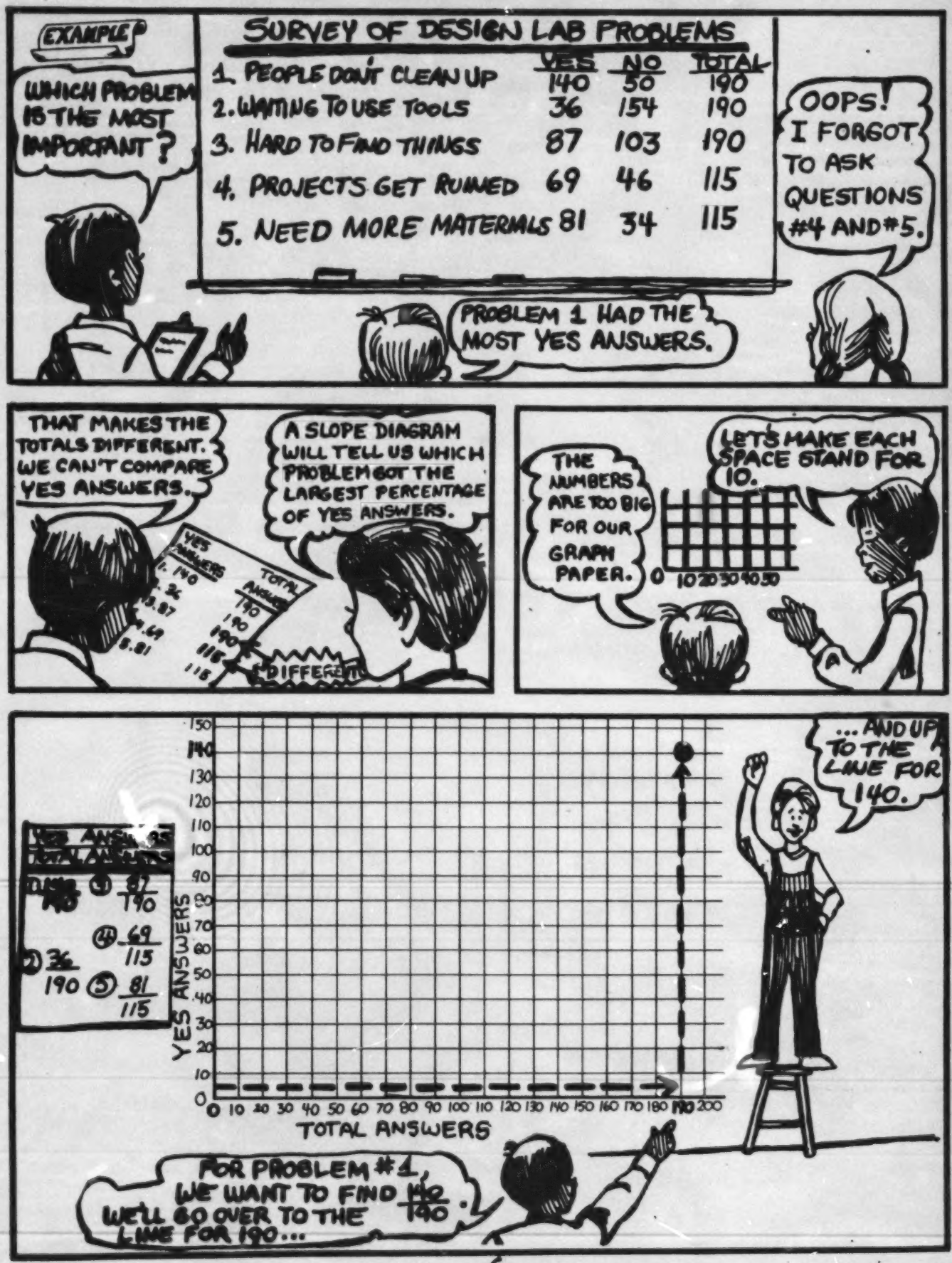
SCHOOL STORE
WHAT THINGS WILL STUDENTS BUY ?
?
CRAYONS
SURVEY
GRADE
WHAT THINGS DO YOU WANT TO BUY FROM OUR SCHOOL STORE ?
LET'S TRY IT OUT ON OUR CLASS.
SURVEY
SURVEY

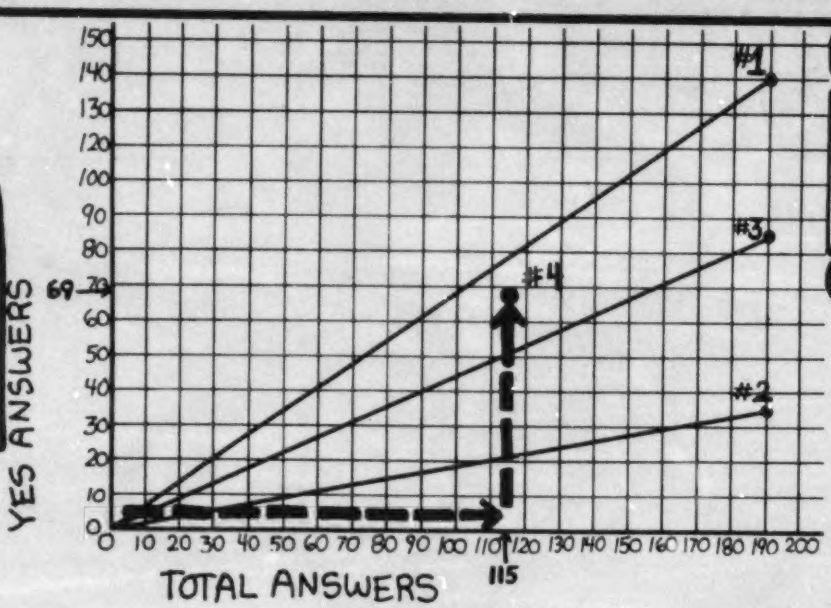

ERASERS, GUM, COMIC BOOKS.
CANDY
PENCILS
TOYS
RACING CARS
SCISSORS
PAPER
CANDY
ERASERS
GAMES
PENCILS
GUM
COOKIES
TOYS
COMIC BOOKS
RACING CARS
CRAYONS
POTATO CHIPS
PENCIL SHARPENERS
PENS
SCISSORS
PLAY MONEY
PAPER
ICE CREAM
CLAY
NOTE BOOKS
PUT SOME OF THOSE THINGS ON A LIST.
THERE ARE TOO MANY THINGS.
LET'S VOTE ON WHICH THINGS TO PUT ON ANOTHER SURVEY.
THEN WE CAN GIVE THE NEW SURVEY TO EVERYONE IN THE SCHOOL.
GOODBYE, OLD SURVEYS!
SURVEY #2
WHICH THINGS WOULD YOU BUY FROM THE SCHOOL STORE?
1. NOTEBOOKS YES_NO_
2. PENCILS YES_NO_
3. PENS YES_NO_
4. PAPER YES_NO_
5. CRAYONS YES_NO_
THANK YOU!
NUMBER OF YES ANSWERS
130
120
110
100
90
80
70
60
50
40
30
20
10
0
NOTEBOOKS
PENCILS
PENS
PAPER
CRAYONS
THINGS TO BUY AT THE STORE
WE'LL SELL NOTEBOOKS, PENCILS, AND PENS.

HOW MANY KIDS USUALLY RIDE A BIKE TO SCHOOL?
EXAMPLE
WE'LL DO A SURVEY.
SURVEY
DATE_GRADE
DO YOU USUALLY RIDE A BIKE?
YES
NO
WE'LL TRY IT OUT ON OUR CLASS.
SURVEY
DATE GRADE
DO YOU USUALLY RIDE A BIKE?
YES
ODo.

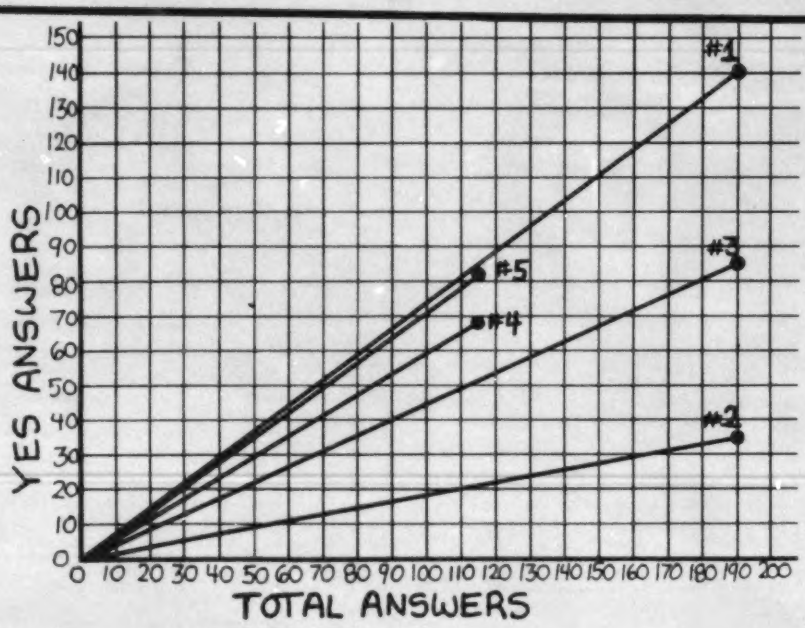

25 SAID YES.
YES
25
NO
3
ONLY 13 BIKES FOR THE WHOLE SCHOOL!?
WRITE YOUR QUESTION IN A DIFFERENT WAY.
SURVEY
DATE — GRADE
YES
NO
SURVEY
DATE — GRADE
DO YOU USUALLY RIDE YOUR BIKE TO SCHOOL?
YES
NO
YES
15
NO
97
THAT MAKES MORE SENSE.


EXAMPLE
SURVEY OF DESIGN LAB PROBLEMS
1. PEOPLE DON'T CLEAN UP 140 50 190
2. WAITING TO USE TOOLS 36 154 190
3. HARD TO FIND THINGS 87 103 190
4. PROJECTS GET RUINED 69 46 115
5. NEED MORE MATERIALS 81 34 115
WHICH PROBLEM IS THE MOST IMPORTANT?
OOPS! I FORGOT TO ASK QUESTIONS #4 AND #5.
PROBLEM 1 HAD THE MOST YES ANSWERS.
THAT MAKES THE TOTALS DIFFERENT. WE CAN'T COMPARE YES ANSWERS.
A SLOPE DIAGRAM WILL TELL US WHICH PROBLEM GOT THE LARGEST PERCENTAGE OF YES ANSWERS.
YES ANSWERS
TOTAL ANSWERS
DIFFERENT
THE NUMBERS ARE TOO BIG FOR OUR GRAPH PAPER.
LET'S MAKE EACH SPACE STAND FOR 10.
0 10 20 30 40 50
YES ANSWERS
TOTAL ANSWERS
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200
... AND UP TO THE LINE FOR 140.
FOR PROBLEM #1, WE WANT TO FIND 140/190. WE'LL GO OVER TO THE LINE FOR 190...

YES ANSWERS / TOTAL ANSWERS	
① $\frac{140}{190}$	③ $\frac{87}{190}$
② $\frac{36}{190}$	④ $\frac{69}{115}$
	⑤ $\frac{81}{115}$



YES ANSWERS / TOTAL ANSWERS	
① $\frac{140}{190}$	③ $\frac{87}{190}$
② $\frac{36}{190}$	④ $\frac{69}{115}$
	⑤ $\frac{81}{115}$



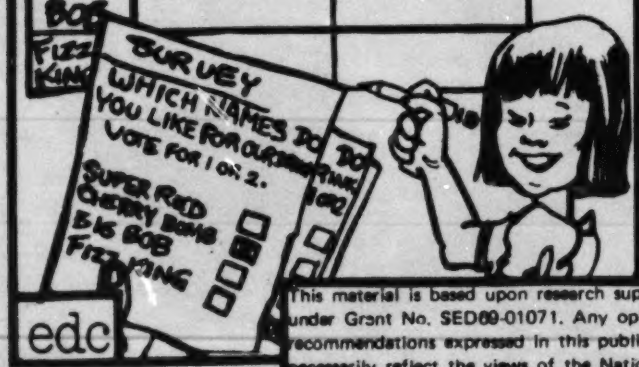
THE LINES FOR #1 AND #5 HAVE ALMOST THE SAME SLOPE.
IT LOOKS AS IF THEY ARE TIED FOR FIRST PLACE.
WE SHOULD WORK ON THOSE PROBLEMS FIRST.

SURVEY

WHICH NAMES DO YOU LIKE FOR OUR DRINK?
VOTE FOR 1 OR 2.

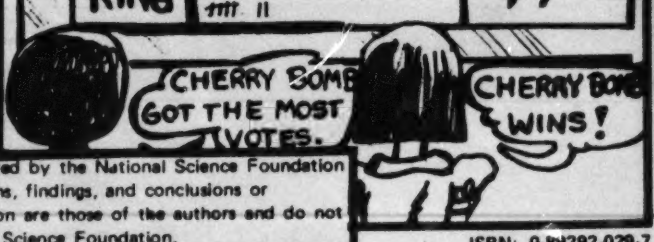
- SUPER RED ☐
- CHERRY BOMB ☐
- BIG BOB ☐
- FIZZ KING ☐

NAME	VOTES	TOTAL
SUPER RED		
CHERRY BOMB	1	
BIG BOB		
FIZZ KING		



LATER....

NAME	VOTES	TOTAL
SUPER RED	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 II	42
CHERRY BOMB	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸	60
BIG BOB	𝍸 𝍸 𝍸 𝍸 𝍸 II	27
FIZZ KING	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 II	47



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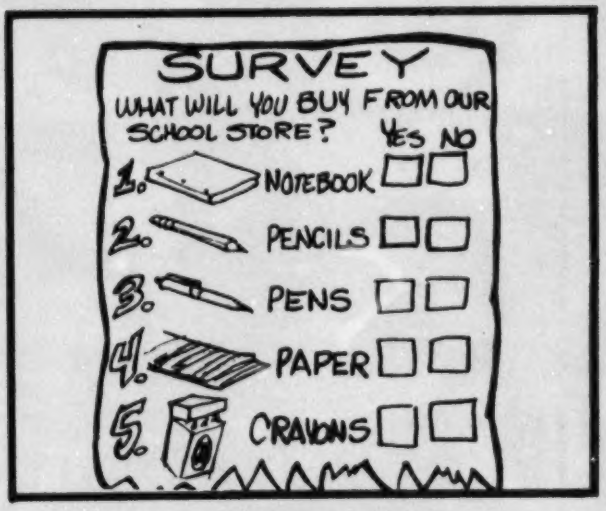
HOW TO
CHOOSE A SAMPLE



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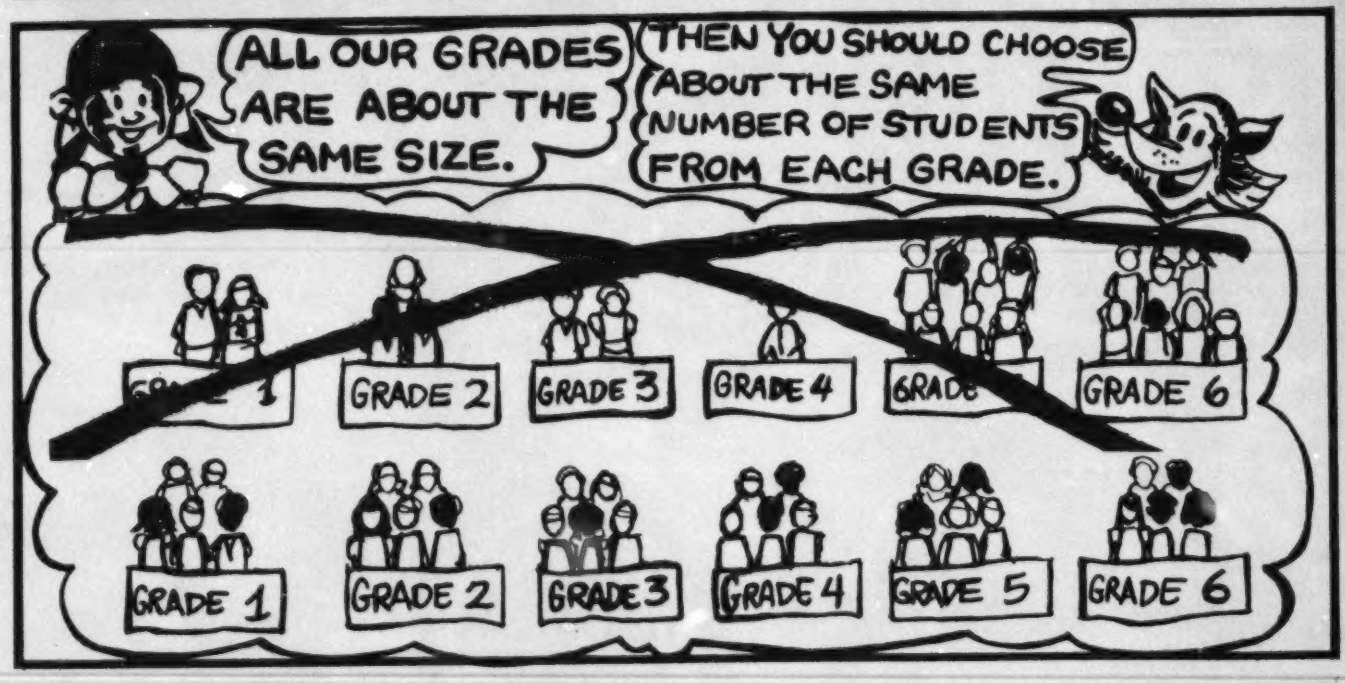
HOW SHOULD WE CHOOSE A SAMPLE FOR OUR SURVEY?
YOU NEED SOME STUDENTS FROM EACH GRADE.
1ST GRADE
2nd GRADE
3RD GRADE
4TH GRADE
SURVEY


ALL OUR GRADES ARE ABOUT THE SAME SIZE.
THEN YOU SHOULD CHOOSE ABOUT THE SAME NUMBER OF STUDENTS FROM EACH GRADE.
GRADE 2
GRADE 3
GRADE 4
GRADE 6
GRADE 1
GRADE 2
GRADE 3
GRADE 4
GRADE 5
GRADE 6

YOU CAN PICK NAMES FROM A BOWL.
1
2
3
4
5
6

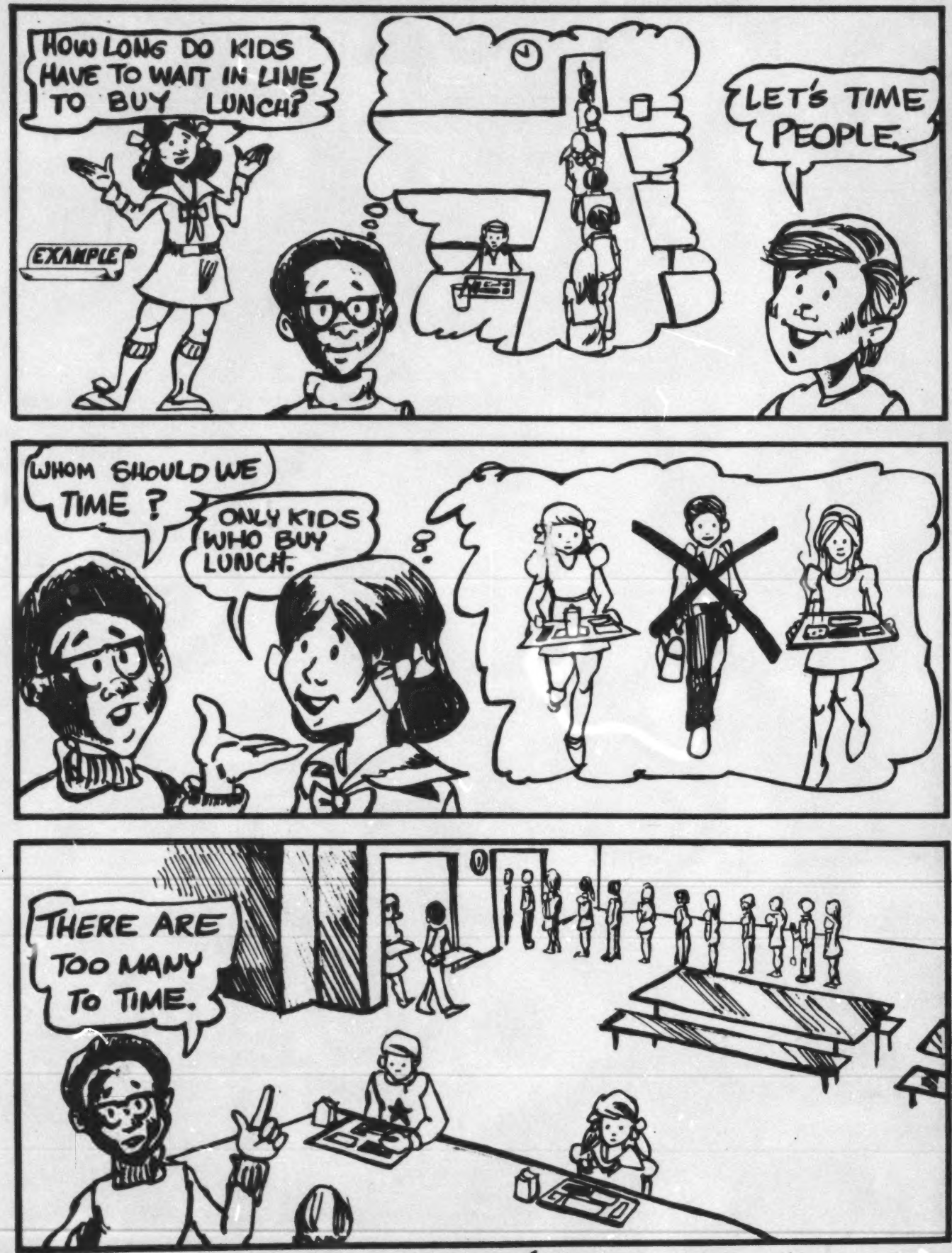
WHERE CAN WE GET NAMES?
OFFICE
FROM THE OFFICE

OUR SAMPLE

GRADE 1	GRADE 2	GRADE 3
ARANO, JOSE ELIOT, FAITH YATES, MANUEL NEAL, MARTHA GALLO, CARL	NELSON, KRIS FRENCH, DIANE DOWNING, SARA SAGAN, FRANCIS BANKS, CONNIE	JOHNSON, MAY RYAN, BRIGET LEARY, THOMAS BERG, DINAH WHITE, NEIL
GRADE 4	**GRADE 5**	**GRADE 6**
JENKINS, RAY MYERS, BRENDA FORREST, JOHN ELMIRA, DONNA BERGEN, SAM	PETERS, SUSAN BLACK, KEVIN HOBSON, GWEN RIVKIN, LARRY JACKSON, ALAN	GRILLO, PERRY MEADOWS, TROY WATERS, LEE PARKER, DARIN WILKINS, HAROLD

LET'S MAKE APRONS FOR ART CLASS.
WHAT SIZE APRONS SHOULD WE MAKE?
EXAMPLE
?
?
LET'S MEASURE KID'S SIZES.
WHOM SHOULD WE MEASURE ?
THE APRONS WILL BE FOR ANY KID WHO WANTS TO BUY ONE.
BUT WE CAN'T MEASURE EVERYONE.
WE'LL CHOOSE A SAMPLE.
GRADE 1
GRADE 5
GRADE 6
GRADE 3
WE NEED TO MEASURE KIDS FROM EACH GRADE.
WE CAN GO TO EACH CLASS AND MEASURE THE KIDS IN THE BACK ROW.

MRS. JONES
GRADE 1
THE TALLEST KIDS ARE IN THE BACK ROW.
YOUR SAMPLE SHOULD NOT BE SPECIAL.
TO MAKE SURE YOUR SAMPLE IS NOT SPECIAL, USE A LIST OF NAMES.
SUE
SALLY
PETE
DORIS
ED
RAY
OFFICE
YOU CAN PICK EVERY FIFTH NAME.
GRADE 3
GRADE 4
GRADE 5
GRADE 6
NOW WE KNOW WHAT SIZES TO MAKE.


HOW LONG DO KIDS HAVE TO WAIT IN LINE TO BUY LUNCH?
EXAMPLE
LET'S TIME PEOPLE.
WHOM SHOULD WE TIME ?
ONLY KIDS WHO BUY LUNCH.
THERE ARE TOO MANY TO TIME.

WE CAN TIME EVERY FOURTH KID.
NEXT DAY
1,2,3...
LUNCHLINE WAIT
NAME IN OUT
4, WE'LL TIME JOE.
LUNCHLINE WAIT
NAME IN OUT
JOE 12:05
AND MARY
LUNCHLINE WAIT
NAME IN OUT
JOE 12:05
MARY 12:04
LATER
LUNCHLINE WAIT
NAME TIME IN TIME OUT TIME IN LINE
JOE 12:05 12:12 7 MIN.
MARY 12:06 12:14 8 MIN.
JOSE 12:08 12:18 10 MIN.
PETER 12:09 12:20 11 MIN.
SALLY 12:11 12:22 9 MIN.
DEBBIE 12:14 12:23 8 MIN.
JOHN 12:15
THAT WAS EASIER THAN TIMING EVERYBODY.

EXAMPLE
WE WANT TO FIND OUT WHICH FLAVOR KIDS LIKE BEST.
I LIKE GRAPE.
LATER
GRAPE IS THE FAVORITE
NUMBER OF KIDS
ORANGE
COLA
GRAPE
ROOT BEER
BUT WE TESTED ONLY 20 KIDS.
IS 20 A BIG ENOUGH SAMPLE?
TO FIND OUT, TEST ANOTHER GROUP OF 20 AND COMPARE YOUR RESULTS.
LATER
THE SECOND GROUP PICKED ORANGE.
1
2
COMBINE YOUR RESULTS.
NOW YOU HAVE A SAMPLE OF 40.
IS 40 ENOUGH?
40
TEST ANOTHER GROUP OF 40 AND COMPARE YOUR RESULTS.
PICK THE FLAVOR YOU LIKE BEST
BOTH GROUPS PICKED ORANGE.
THE RESULTS ARE ABOUT THE SAME. OUR SAMPLE OF 40 WAS ENOUGH.
edc

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